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BIBLIOTHECA REGIA HAFNIENSIS
Von der
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übernommen

-18/121

Cover: Engraving on copper by Robert Nanteuil, 1666.

Of Portraits and Engraving

On the cover you meet the wise and cool (and very experienced) glance of a French nobleman and highly select ecclesiastic. Although his face is turned slightly aside his eyes are looking directly into yours.

It might be a rewarding idea to turn back to him for yet a while in order to get further acquainted with him after that first brief encounter. You could just sit back and contemplate him a bit longer, and you will soon find out that he was decidedly not born yesterday. Neither in matters of the confession box nor in those of very worldly affairs should anybody try to cut corners with him! *Also there is a wee hint of a fleeting smile, a certain measure of shrewd scepticism, much pensiveness and a good deal of serene afterthought.*

Maybe after all his eyes are not interlocking with yours quite so directly as you thought they were. His glance has veered away a bit and for a moment it has come to rest at some indefinite point in mid-air, somewhat off your right ear, as it were.

And, like all good portraits, you will find this a difficult one to exhaust. There are still a number of indefinite traits, uncertain aspects the depth of which you may try to fathom. But you will never get them quite definite. So much of their definition is left to the imagination or even to the momentary mood of the spectator. A wee bit of playfulness in his expression, slightly equivocal qualities about his glance, hinted quivers in the fine and precisely drawn facial muscles where the artist has managed to capture fleeting nuances of interpretation that go beyond the boundaries of spoken or written prose. If one is truly taken in by a superb portrait one's mind is arrested in a way that differs widely from the sort of attention one would pay to a picture of any other subject, be it a landscape, a house, a cluster of trees. Whether we are consciously aware of it or not, the picture of a human face calls for wider fields of our attention. It is so to speak adressing further realms of our minds. And we are, also whether we recognize it or not, far more sensitive to the effects of even very small deviations and minute linear alterations in a portrait than we would be to similar alterations in landscapes or other motives.

This of course depends entirely upon the portrait being a really good one, i. e. that it is one of human engagement or artistic merit. Or preferably both. And Nanteuil's engraving on the cover is a good one. A truly outstanding piece of portraiture.

On our cover reproduction it has been boldly enlarged. On the actual engraving his entire face is a trifle shorter than the length of a common cigarette. Furthermore the picture has been cut down substantially so that only his face is shown. Costume and surroundings have been cut away. The hint of clerical neckwear and an almost invisible bit of oblate episcopal skullcap do not disturb our impression of the man's face, that might well be from to-day. If it were not for the peculiarly old-fashioned way in which his picture has been made he could be a person we just met in the street.

We should feel no astonishment in seeing him on the dais of a concert room, strumming his guitar, or on some service station, giving the windscreen a once-over. We would take him for granted, if we saw him tutoring in a lecture room of some campus, or watched him on telly, commenting to-day's News. The intrinsic qualities of his portrait are the eternally human ones. His hairdo is perfectly modern. And his hairline moustache is a downright smasher with the girls of 1974.

He was engraved in 1666. Well over three hundred years ago. Long before the first portrait was ever put upon any banknote.

His name was neither Mazarin nor Richelieu, nor Talleyrand, but he was decidedly of the same breed! Entirely conversant with theological and philosophical intricacies or subtle points of divinity—and equally familiar with very worldly affairs where substantial chunks of cool cash were involved. His long, complicated and very distinguished name was Pierre du Cambout de Coislin and his string of imposing titles was longer still, and completely insignificant in this context. The important thing is the fact that his portrait was drawn and then engraved in copper by Robert Nanteuil, *one of the greatest engravers that ever lived.*

(Continued on the inside of the back cover)

Von der
UB/TIB Hannover
Übernommen

"engraved in copper"

That his portrait was engraved in copper means that Nanteuil drew it and subsequently traced his drawing on to a copper plate, then engraved it into the metal and finally printed it on to paper by filling in the incisions with printer's ink.

One of the prime virtues of academic draughtsmanship in those days was the fact that the various tone values of the drawing were often laid out in very accurately dispersed line structures. The correct dispersion and shaping of these required a highly developed sense of anatomical and tactile descriptiveness. This applied to an even more exacting and meticulous degree when the pictures were eventually to be engraved. In really distinguished copper plate engraving these hatchings were done with exquisite skill and perfection in their variegated regularity.

The drawing was put upon the copper plate either directly or by means of a tracing. And then the actual engraving took place. The engraver used a hard, sharpened steel instrument called a graver or a burin, the point of which was shaped to incise V-shaped grooves into the surface of the relatively soft and yielding copper plate. If the burin had been ground correctly it simply cut out a nice metal shaving, curling up neatly and cleanly in front of the travelling tool without throwing any burr and only leaving a sharp and pretty groove in the blank surface.

This kind of line engraving is the form of art the French call "the soft cut", la taille douce *(also frequently written with a hyphen: taille-douce). The hard and sharply ground V-shaped burin travels with a certain pleasant ease in the surface of the soft copper, and on its way it meets with only so much or so little resistance as to support the artist in steering his lines and points with all the deliberate calm and clarity, care and control that has always been the hallmark of this graphic art form.*

la taille douce

The V-shape of the burin meant that the engraver had only to gently press his tool a little bit deeper into the copper and thus achieve a line that went, not only deeper, but at the same time wider as well, simply because the angularly sloping sides of the burin's edge sank deeper into the copper.

So the engraver could for instance start his line gently and cautiously quite near the surface level, fine and thin like an exceedingly narrow hairline trace of a cut. Then he could, slowly and gradually, permit his tool to go deeper so as to make the furrow wide and bold, and then finally to ease it off, little by little and let it slip in the same delicate manner as he started, eking out like a mere wisp of a line, almost like the coming and going of stressed and unstressed strokes in a beautiful handwriting.

Nanteuil's engraving demonstrates this in a strikingly eloquent way, for instance in the region to the upper right hand side (just below the title) where some quite wispy trails of his hair have loosened themselves from the larger strand that has fallen softly over his forehead. These thin trails of single hairs, seen in comparison with the entire strand, give a comprehensive and clear understanding of some of the characteristic qualities of taille douce. *And to the left hand side of the picture you will find that the entire rendering of his hair all the way down along the side of his face is virtually a complete and very masterly performance of this kind of variegated burin-work: a veritable show of the engraver's calligraphy on the copper plate.*

A somewhat different, but entirely related form of burin-work is seen on the area of the nose, the forehead and the cheeks. If you inspect this a little closer you will perceive how Nanteuil has put his burin into the steel and "flicked it up" again so that the material character of the skin tones is achieved by means of these little comma-like dots or small abrupt line stipples.

You will also, everywhere in the picture, be able to observe how the directions of his burin-work meticulously follow the sculptural shape of the things they represent: the small comma-shaped "flicks" are precisely arranged so as to follow the surface of his skin as its swellings and hollowings reveal the underlying bones of the face and its array or system of delicate and expressive facial muscles. The mouth is splendidly engraved. Look how the burin strokes are suddenly eased quite, quite thinly up near the very surface of the copper into the very thinnest of lines where they are intended to represent the small, slightly humid highlight upon his lower lip. The frail, reddish part of semi-transparent skin of the underlip itself, in many faces, only partially reaches down to its lower edge, and not even a characteristic detail like the slight concavities on either side of the little soft central knob of his upper lip has escaped Nanteuil. (Study the detail shapes of your own lips in the mirror, or those of your friends and in quite a number of them you are likely to find subtly individual variants of entirely similar traits!) And look how precisely his concentric hatchings describe the actual size of the eyeballs, largish as they really are inside their sockets, but visible only through the almond shaped slits of caressingly modelled eye-surroundings.

Not even the soft little bend in the linen material of his clerical neckwear has been overlooked: Some nice and elegant little sways—plus an ever so faint alteration to burin pressure as the lines went along—and there you are! Perfect.

In practical life this art form has to-day become virtually extinct. It requires such unparalleled skill and talent, such uncompromising patience and command and decades of practice that for common use in picture reproduction nowadays it would be prohibitively expensive—and unreasonable.

(Continued on the back of the cover)

Unreasonable because the sundry modern ways of photographic and chemigraphic picture making can reproduce even the most spontaneous and sketchy manners of drawing with an astonishing degree of fidelity.—And to-day good reproductive results can in many cases be achieved with such perfection that in comparison the "old" manner of engraving would seem to be reduced to an exasperatingly finicky, drab and deadly pursuit of unspirited detail. Talented improvisation and deft sketchiness are simply alien concepts as far as la taille douce *is concerned.*

If you want hazy or perspectively dwindling effects of vignetting-off, and if you are after elegant hints of subordinate and airy detail to appear lightly touched-in you can do such effects with incomparable grace in engraving. But the burin can not just improvise them, like a piece of pastel or a watercolour brush. They must be articulated lighthandedly but with the utmost deliberation and care. Spontaneity is the one *among all artistic virtues that is absolutely remotest from this particular brand of engraving!*

and modern banknote engraving

But upon banknotes and other securities this otherwise obsolete art of bygone centuries is still thriving—and will remain thriving for years to come, even (in the technical sense) in still more sublime and refined qualities, preferably on steel.

The free, pictorial parts of banknotes are surely one of their most important features. This free-hand engraving is done by highly trained specialists, and apart from the further components (lettering, machine engraving and the like) the engraved pictures, whether they represent landscapes, animals or other motives, are doubtlessly the items that command immediate public attention. The importance of this applies above all to the expertly engraved portrait, because it is so vulnerable, so sensitive to small alterations that the potential counterfeiter must be tremendously careful in avoiding deviations from the likeness.

Upon two enlarged detail photographs elsewhere in this booklet (ill. nr. 4 and 5) you will find both an original print and the actual steel engraving for the the H. C. Ørsted portrait known by all Danes from their customary 100 kroner note. By comparing this with Nanteuil on the cover you may get somewhat further acquainted with the ways in which the venerable taille douce *has been transformed into present day security prints.*

If you look at the forehead, the nose and the cheeks in the two pictures respectively you may for instance compare how the skin-representation by Nanteuil, his little elegant "comma-flicks" with the burin, have nowadays, in the Ørsted portrait, developed into meticulously dug-out, carefully organized and disciplined systems of quite tiny, but precisely shaped incisions that cannot possibly be made by one little dexterous flick of the burin per dot. Slowly, patiently and repeatedly the engraver must enter his burin into every single line or dot in the steel. Several subsequent times into each of them and from various sides as well, in order to ensure that each single one has got the appropriate size and shape, and the proper gradation of depth, that will make their assembled effect in the final print create a neat, sharp and pure engraving of a portrait, for instance like this one where you see, emerging from the entirety of dots and lines a veritable "resurrection" of that gentle and debonair old professor Ørsted, sending a friendly little glance to Wilhelm Gertner, the artist, one hundred and thirty years ago, during the session for the delicate little portrait drawing that has since, from the engraving, become so intimately familiar to everybody in Denmark.

Gunnar Andersen

BANKNOTES

Principles and Æsthetics in Security Graphics

Printed in
Danmarks Nationalbank Banknote Printing Department
Copenhagen 1975

FJ 9355

A general orientation, issued in conjunction with the Danish Banknotes, "serie 1972"

UNIVERSITÄTSBIBLIOTHEK
HANNOVER
TECHNISCHE
INFORMATIONSBIBLIOTHEK

Foreword

One of the items of discussion on the agenda of the INTERPOL conferences in Copenhagen 1961 and in Mexico City 1969 was the question of how to keep the public well informed about counterfeits and the characteristics of new types of banknotes.

The present publication should be seen in the light of that debate.

It is a translation, and partial re-writing, of a booklet that was originally issued in Danish by the Danmarks Nationalbank in conjunction with the introduction of a new series of banknotes, called "Serie 1972" and scheduled to go into circulation in 1974-75.

New emissions of banknotes are not frequent in Denmark, and counterfeits are very rare. Under such circumstances the public attitude to banknotes is generally one of automatic and unreflected confidence. Their graphic qualities are simply taken for granted without further scrutiny, and in daily life the habitual degree of public attention is one of mild negligence.

Of course this prevailing atmosphere of common trust is a thoroughly commendable and very valuable state of affairs, but admittedly it also entails a certain degree of nonchalance that may occasionally render the normal daily banknote circulation more vulnerable to the odd, stray counterfeit's passing unnoticed, simply because the public is unprepared for it. The average citizen is largely uninformed in this respect, and thus unaware of the specific virtues of security printing. One of the side effects of this is the uncertainty and the involuntary shortcomings of knowledge felt on the infrequent occasions when such topics are touched upon in the news media and by various public authorities.

For such reasons the aim of this publication—beyond the mere formal presentation of the new note issue—has been to contribute to the improvement of general public information in this field, not so much by addressing the public directly, but more by furnishing the press, the cashiers, the police and other interested parties with relevant background-material, more understanding and knowledge (also beyond one specific series of banknotes) as a stimulant for further use in their various public activities, in order to qualify criticisms and to open up viewpoints of a more initiated nature than could have been otherwise expected. These topics are very sparsely dealt with in commonly available literature. It is expressly stated that no copyright will be claimed. The content of the booklet is at the free disposal of any of the news media and may be used at their discretion.

At the same time the official cautions, the penal code and the rulings of the Bank regarding pictorial reproduction of banknotes are clearly underlined. The presentation of the new series itself is done by means of simple line diagrams, confined to the mere outlines of their scheme of composition. Apart from this there are museum photographs of the original works of art that have served as motives for the engravings.

The text itself is a short survey of banknote engraving, explaining and illustrating the characteristics of the various items of security graphics generally found on banknotes, their "raisons d'être" and their degrees of importance: how they ought to look when they are genuine, and how they mostly look when they are not. It is by no means a thorough, scientific review of these matters, because in this context it has been regarded as a more important task to do this in a lively and easily-read form, perhaps occasionally approaching entertainment lecture, with a generous sprinkling of pertinent digressions artistically, aesthetically, technically and security-wise. It is an attempt to sharpen general public appreciation of security qualities in printed matter, but of course at no point revealing vital secrets of production.

Nearly all reproductions in half tone screen photography are from obsolete, historical banknotes that have for years been redeemed of money value, and the few illustrations that bring genuine and counterfeit versions of a circulating Danish 100 kroner note are reproduced only partially and in gross oversize expressly intended only as a guide for the Danish reader to find the corresponding parts upon the live note he is likely to carry in his wallet *and to inspect these various parts closely through a good magnifying glass when he has read in the text what it is all about.*

The editorial principle of the List of Names and Terms has been obtained by asking an intelligent, but otherwise uninformed reader of the manuscript to underline any query he might have, and then writing a short lexicographic answer to each of his underlinings.

The present English version of this publication is forwarded to institutions, friends and colleagues abroad who might take an interest, and perhaps even consider taking corresponding initiatives in their own countries within this field.

Danmarks Nationalbank

On Security Graphics

This account of the characteristics of paper money is intended only as an introduction, and it is by no means a work of reference. The aim is broad and general, and the narration is hoped to be as easy and uncomplicated as the subject matter will permit. It is meant as a source of material, and of sundry definitions, pertaining to banknotes, seen purely as advanced items of printed matter.

A considerable number of books have been written about paper money, but most of them are concerned with history of issues, financial and political backgrounds, compilation of collectors' catalogues, accounts of monetary crime, case studies of large criminal affairs of counterfeiting etcetera. There are only sparse literary sources to knowledge of banknotes seen solely from artistic and security technical viewpoints. So far very few books at-all have been written on this, and certainly none in Danish.

It is in the nature of things that detailed and instructive directions of how to make money—literally!—are not made publicly available. And nor will this booklet be of any assistance at-all in taking short cuts to wealth, but it is nevertheless dealing with the basic theme itself, i. e. the principles, the techniques and the æsthetics of security graphics.

In some countries this topic has occasionally been treated with a certain amount of frankness, but still this field of the graphic arts has always remained a more or less exclusive corner that might easily turn into a cloistered, sectarian "church of its own", as professor Gunnar Biilmann Petersen once put it. In various security printing works and central banks small isolated handfuls of expert technicians and highly educated artists, occasionally of exceptional talent but nearly always anonymous, have formed closed-in circles behind their concrete walls, known from country to country only by very few equally initiated, and isolated, people.

And of course this field must of necessity remain a closed and well-guarded one. But still, the æsthetic aspect of it could at some time deserve a more thorough literary analysis, because it forms an intriguing and beautiful chapter in the History of Work and Skill.

Some professionally initiated readers may feel that this book over-emphasizes the American contributions to the development of security graphics. And others may feel that the entire French school of fine, multicoloured xylography, printed in register with frail and elegant engraving, has been unjustly dismissed in one sentence or two. Both kinds of critics are absolutely right: a very similar account might just as well have been written using British, Russian, Hungarian, Austrian and several other schools of security graphics instead.

The author has deliberately narrowed down his field of vision and selected a comprehensive microcosm that lent to a complex theme a sort of puppet-theatre clarity or simplicity: for stage setting in a central act is chosen the North American scene with its circle of inventors and pioneers in banknote manufacture. And no slighting or overlooking of others has been intended: this is *a* booklet, not *the* book.

In the rear part of the book there is an explanatory List of Names and Terms used in the text, and there is a Literature List of further reading on the subject.

Various capitals and other places in the world have public collections of paper money. Some are in museums and libraries, others in banks. On an international scale it would, however, be too much to list them all here. But quite a few of them are very rewarding places to visit. Their names and whereabouts can be found in numismatic literature or tourists guide books, telephone directories etcetera.

Acknowledgement:

For useful suggestions and never faltering patience in proofreading of the manuscript for the English version I am greatly indebted to Mr. P. R. Price, B. Sc. F. I. Mech. E. &c, Epping, Essex, whose highly qualified support has been a most relieving experience during the job of re-writing the entire theme in a language that was not my own.

G. A.

Psychology of the Banknote

everybody's trust in a piece of paper with printer's ink upon it

You know how it is if you happen to come across a half forgotten pile of printed matter. If, in looking through some miscellany of old bills, aged newspapers, obsolete admission cards, yellowed business advertissements and expired lottery tickets, you suddenly stumble upon a banknote you stop with a jerk.—Why, that's funny! A banknote! What do mine eyes behold? A sweet and lovely, live and veritable banknote. Why is *that* lying about here? Among all that printed matter? We don't give one second's thought that the banknote itself is also "printed matter". It doesn't come under that heading at all. Above all it is Money, a value in itself. Or rather: it is *the* value, in downright tangible and immediately useful form. And it is decidedly untidy that it is floating about there, among all that printed matter . . . .

"Ready Cash", "Cash Down" are terms of poetic beauty. Doors open up. Benevolence, submissiveness, politeness or the like of it flourish around you, and you perambulate at ease through a world of smiles and bows. Goods are delivered with the speed of lightning. "Yes please, Sir", "Thank you, Sir". Immediate payment (in its finest, undisputed form) means BANKNOTES. From hand opening up, into hand gently closing, like a caress. No promises and no writing but sweet notes between the fingers. This is Bliss. The counting of banknotes into an outstretched hand: *Comptant!* In French the present participle of the verb is simply synonymous with cash, and among the inseparable gestures accompanying the word is a mild and mute, but infinitely eloquent, patting of the hand in the chest region, where the heart and the wallet are generally situated. "There is nothing quite so *reassuring* as money", exclaimed a gentleman who got a somewhat dated claim honoured. And this emotional significance pervades all strata of society. Be it the humid and somewhat decrepit bum standing alone on the brink of the quayside one murky night, delivering his final soliloquy to the floundering fish down below, but then decides to postpone his suicide because he suddenly finds tuppence ha'penny in the deeper regions of his trousers. Or be it the oil sheikh in the Berkeley Square show-room who absent-mindedly pays cash across the counter for his fifth Rolls.

How does one ever understand this magic? After all the banknote *is* merely printed matter! The handful of tenners that would buy a new television set have cost no more than 25 p in the making, at the most. Some leaves af paper plus a thimbleful of printer's ink—and there you are! "Thank you, Sir, and to what address do you want us to take the set?"

—If we go to the museum and look at collections of *old banknotes* the spell is suddenly gone, the magic has evaporated, and we look upon them merely as fine old samples of printed items from yesteryear. We may, with mild interest, appreciate their aesthetic beauty, their historical quaintness, their pompous allegories, their ugliness or their simple charm. But the notes we carry with us, *in our wallets* are something quite different:—They are *Money*. Things of consequence. Serious affairs. Housing and clothes. The Daily Bread. They represent the down payment for the hire-purchase hi-fi set. To refer to them as "printed matter" is in bad taste, coquettish and close to sacrilege. It is an untimely arrogance. They are valid banknotes. They are MONEY.

Our trust in them must come from our firm conviction in everybody else's trust in them as well. We have no doubt whatever they will be accepted readily and unreservedly by everybody, notwithstanding the fact that they are really nothing but pieces of paper upon which the national bank has written a couple of text lines and some figures. And this is no less than a psychological miracle. This trust is very nearly the most precious and fundamental thing we have in the daily life of a functioning, well ordered society. Without this public trust banknotes would be an impossibility.

Still, let us look at them. Without awe and philosophy. As simple and handy items of daily use. As

instruments or tools. As printed matter. In reality they consist of a few grammes of paper and still fewer grammes of printer's ink.

The Banknote as printed Matter

its paper

We can feel the paper is a good one, better than most other sorts. It crackles and the sound has a ring to it. It is made of the best of materials, mostly pure rag. It need not necessarily be thick. Even in countries where banknote paper is thin, as in France for instance, it is strong, it has character and feels valid between the fingers, and if we hold it against the light we shall frequently find intricate watermarks that are embedded "inside" the paper. At times we also find a security thread, of metal or other material, also entirely embedded in the paper.

Some countries have banknotes with coloured fibres mixed into the paper mass, others have little discs like confetti, and still others have introduced invisible fibres that fluoresce strongly under ultraviolet rays. Frequently the watermark is a localized one that shows up within a definite area of the note, or it may run freely through it like a frieze, or spread all over it like the pattern of a wallpaper.

Only rarely is the watermark confined to showing merely some light and meagre lines or words of lettering with nothing but a sparse light filigree, as in some piece of stationery. The watermarks of banknotes are usually a good deal more sophisticated. They have light tones *and* dark tones as well. Often they are pictures, little works of art with many shades inside the white or coloured paper, made by experts whose achievements are extremely difficult to imitate if real likeness to the genuine thing is wanted. There are, or rather were, banknotes whose safeguards against counterfeits were mainly based upon the uniqueness of the paper and the superb distinction of their watermarks.

In the Far East, where the craft of papermaking has more than a millennium of tradition behind it, watermarks of incomparable beauty are still being made. But elsewhere a fine tradition has also developed over the centuries. This is for instance true about the old white £5 note that during World War II was subjected to Heinrich Himmler's sinister doings in his concentration camps. SS machine guns guarded the trebly barbed-wired Barracks 19 of Sachsenhausen that he let his sub-leaders Alfred Naujocks and Bernhard Krüger fill with a medley of captured experts and experienced criminals in his notorious attempt at a giant counterfeit scheme, the so-called "Operation Bernhard", designed to undermine the economy of Great Britain by flooding the country with counterfeit notes. Even these professionals, working under merciless compulsion and with their wretched existence at stake, did not quite succeed. After the end of the war heavy boxes with tons of unused and discarded counterfeits were dumped into the deepest alpine lakes and rivers of southern Germany. And the relatively few counterfeit notes that were actually passed in Great Britain were detected in the inspection rooms of the Bank of England.

The various shades that form the pictures, the lettering or the patterns of watermarks are due to "inherent" differences in paper thickness. Where the paper is thin, the picture is light and where it grows thicker, it becomes darker. Counterfeiters often try to imitate this by printing the picture *upon* the paper in whitish, opaque ink resembling the paper colour. But the likeness is always poor. They may occasionally succeed in deceiving the casual glance, but generally it only takes a second look to arouse doubt. The feeling of quality has gone. It remains advisable always to pay attention and to at least *look* at the notes one accepts. Bank clerks and cashiers working day in and day out handling banknotes know about this. Some very few of them may have become wise the hard way but with the majority it is simply a matter of paying the natural attention that is due in responsible daily work. Most counterfeits of foreign currencies coming to Denmark are discovered by alert bank people who are used to seeing genuine money incessantly during the day, and they react immediately to anything phoney, be it the feel of the paper between the fingers, the look of the watermark or perhaps some lack of definition in the print.

and its print

The above mentioned £5 note from the Bank of England had a delicate, almost frail but exquisitely well engraved main print, that was designed *to let the paper appear as predominantly as possible,* because nearly all of its counterfeit-precautions or security measures were placed in the paper and the distinctive character of its watermark. But the U. S. dollars for instance have no watermark at-all. They are, admittedly, printed upon high-quality, very durable and quite special paper that has in addition got a medley of quite distinctive red and indigo blue textile fibres dispersed into its pulp during manufacture, but as far as security measures are concerned the accent has above all been placed in the *print,* in the sense that the engraving of the original plates and the quality of their reproduction in print is by far the most important feature of their security.

The same applies to a very marked degree to the Soviet roubles and to the Chinese notes whose origi-

nal plates are among the most beautiful and finely executed in the world. Both of these countries have mainly placed their security against counterfeiting in the extraordinary quality of the original plates for the print.

But many other countries, Japan for instance, combine these points of view. The Japanese have admirably well made banknotes, designed and engraved by excellent specialists, but at the same time they are printed upon paper with superb watermarks that are entirely worthy of the ancient Far Eastern traditions of papermaking.

Here in Europe these two viewpoints: Security in paper or security in print are usually both applied, with varying degrees of dominance. As any tourist to that country will have noticed, France for instance has elegant watermarks embodied in her at times almost cigarette paper-thin material *plus* a characteristic multicoloured print. But Hungary, that does not seem to stress watermark- and paper-effects particularly has her originals engraved with a highly select and very masterly executed performance of the engraving and etching techniques that over generations have developed within the realm of international security graphics. In contrast those specific traits of engraving and etching are almost non-existent in French notes.

Safeguards against Counterfeits

the contents of a banknote and its security

Preparations for a new banknote commence by establishing its technical specification. And upon this you start visualizing its artistic possibilities. Already from the first tentative scratches upon the almighty, glaring voids of virginal paper in front of you and subsequently during each single stage of its development towards a final and definite thing you will of course feel an urge, and a challenge, to accentuate its aesthetic aspects and its design so as to make the note become a worthy representative of your country, its culture and its sense of quality. But the prime concern, above all other considerations, also pervading all æsthetic intentions, should be to make its imitation as difficult and problem-laden as possible. To see to it that every little part-decision in this process be subjected to the idea of presenting such a disheartening amount of obstacles and worries that the potential criminal is either completely discouraged from entering upon his nefarious scheme at-all or that the problems entailed are such that his precarious task is doomed to failure.

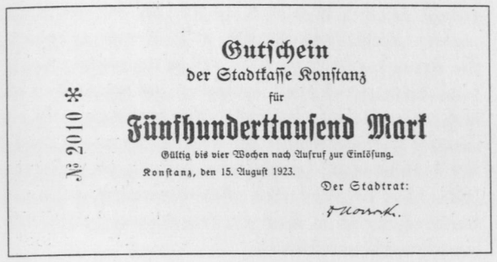
This can be aimed for in several ways: Essential parts of the banknote should be the result of costly, complicated and inaccessible technical equipment, operated by advanced specialists whose skills are utterly rare, and known to only very few in practical life outside the confines of security printing works. The various components of the banknote, its ground patterns and its sundry decorative elements of more prominent patterns, its lettering, pictures etcetera may be executed so that their qualities are evident and their visual effect characteristic in a way that differs significantly from those of other printed matter. And these qualities should, even to the more or less ignorant, or at least uninformed, public be easily recognizable so that imitations will "look wrong" straight away, even at a casual glance. Such items upon banknotes may be conceived so that they look simple and are easily perceptible, and yet very complicated by their precision and detail, having a character of their own in the finer and bolder structures of their protective underprint and in colour combinations that would turn unwanted attempts at their reproduction into an extremely intricate task. Apart from this you may of course let the numbering (with specially designed figures that are unobtainable in common trade) and signatures merge into secret systems of codes, that would also have to be broken if a larger criminal approach were to be embarked upon. The inks with which to print them each have their individual recipe with built-in traps that are not so easily cracked. And these recipes are of course also well guarded secrets.

the formal contents do not suffice

The editorial contents of the banknote are principally the requirements of law: The name of the issuing authority, the value of the note (in figures *and* in lettering), a reference to date and number of the bill, specifying the relevant paragraphs, that form its lawful background, the authorized facsimile signatures of responsible officials, the individual numbering of the print series and the single note, plus—in some cases—a quotation from the penal code's paragraphs on forgery and counterfeiting. And that is all.

There are (or have been) notes in existence that do not contain very much more than those bare necessities. Around the birth of the Weimar republic, directly after World War I when the German inflation was soaring at its wildest and reaching insane heights there was so little time to prepare new issues, and the banknotes went down to such negligible rates of exchange that actually pieces of ordinary white paper bearing the imprint of a pair of common letterpress textlines (that could have been printed anywhere with the same, or a sufficiently similar appearance) were sent into circulation with a fanfare legend that read *"Zehn Milliarden Mark"*, ten billion! Which would just about

cover the price for a couple of buns for breakfast—that is provided you hurried down to the baker's and bought them before the next exchange rate for dollars arrived.


Gutschein
der Stadtkasse Konstanz
für
Fünfhunderttausend Mark
Gültig bis vier Wochen nach Aufruf zur Einlösung.
Konstanz, den 15. August 1923.
Der Stadtrat:
№ 2010 *

Here is one example of such crazy banknote issues. This really is the sheer lunacy of inflation at its worst: Apart from the items that appear plainly from this diminished line reproduction hardly more had been done to this piece of white paper than a simple filigree watermark and a rough, coin-size relief embossing (that would have vanished into an untraceable crease after two days of circulation).—Yet its "value" was 500,000 Mark!

So it does not suffice that the banknotes are "valid" and that they are solemnly declared to be legal tender. It is by no means the content of the note, neither the promises, phrazed with official gravity, nor the impressive juxtapositions of numbers and flourished signatures of pompously titled officials that give circulating banknotes that particular character without which they are abjectly reduced to nonentities of printed matter or, at the best, just quaint historical mementos and collector's pieces. The important quality of a banknote is the common faith in it. The citizen must have implicit confidence in it and rest assured that the banknotes he handles are genuine and valuable.

not only what the banknote tells
but how it tells it

So of course what really matters about the prints upon banknotes is not how they *read* but how they are *made*. The convincing authority of their high quality level, the plainly evident difficulties in making them look precisely like *this* are infinitely more important features than the mere legend they spell out.

The main print of good banknotes is always *engraving*. And the actual printing of it should in all important parts be *direct plate print*. The common Danish term for this is almost invariably "copper print". Notwithstanding the fact that banknotes are very often engraved in steel originally and then printed from surfaces of nickel or chromium this method of printing has, at least in the Scandinavian languages, come under the general label of "copper print".

This is likely to be due mainly to the fame and esteem that copper engraved book plates and framed pictures (for hanging upon the wall) once came into as opposed to former days' more rustic and coarse woodcuts for the same purposes.—This transition must have come about in late renaissance and baroque. And of course subsequently, during the latter part of the eighteenth and early nineteenth centuries this esteem increased further still when the spell and charm of the many very sophisticated works of art emerged in large numbers from the great cultural centres of old Europe; London, Rome, Paris and so on. French rococo, for instance, produced eminent works of art of a hitherto unseen virtuosity in pictorial representation with astonishing perfection in print, by the technique called *la taille douce*, "the soft cut". And eventually such works (admittedly in a somewhat more modest and prudent vein, artistically) also came from our own compatriots during the academic neo-classicist periods where Danish copperplate engravers like Clemens and Preisler achieved simple and admirable results in this field, that you might call an art of patience, elegance and quality.

As briefly mentioned above there is a slight confusion in Scandinavian usage of terms within this field. This is, however, not important (and is only touched upon for the sake of clearer process-description in the following). The thing that, in the Nordic languages, is most commonly referred to as "steel print" would more often than not stand for what in English is called *diestamping*, and although this noble craft is also a form of printed engraving its processes are not fit for banknotes. It is indeed a high-class process, but it lacks the delicacy and range of variation in tones and structures that characterizes proper security engraving. It is done upon little pieces of good steel and is commonly carried out in comparatively deep engraving that gives the final print a very narrow range of ink gradation, if any. Its objects are usually a very exact and sharp lettering or rigidly stylized picture engraving, often heraldry, coats of arms etcetera, employed for finer qualities of visiting cards, letterheads for distinguished stationery and the like. Frequently aided by an embossing counterform from the opposite side of the paper the prints are pulled under very high pressure so that the paper around the motifs is often strained into a marble-like hardness and at times the surface of it obtains a gloss, looking almost like a polished finish upon which the print stands out proud in a very marked way.

Technically, as a principle, this does closely resemble the printing of banknotes, but graphically, as a means of artistic expression, the two are poles apart.

Æsthetically the virtues of diestamping are those of hard, clearcut, unmodulated and definite items of print boldly standing up upon more or less calandered paper and it has almost nothing in common with the æsthetics of engraved security printing as applied to good banknotes. But still: Let us consider further the artistic difference and the purely technical affinity in the principles of diestamping versus security printing.

the peculiarity of the engraved security print as opposed to "common printing"

A close scrutiny through the magnifying glass will show you that the genuine, engraved banknote print also has its ink piled literally "on top" of the paper. Admittedly not nearly as proud and ostentatious as in diestamping, but still frequently with sufficient height for the ink to be clearly felt to the fingertips when touching the dark and dense parts of deeper engraving.

This is due to the fact that all the little lines and dots that, to the naked eye, more or less merge together to form the picture are printed from engraved *recesses* (grooves and carefully shaped holes below plate level) and *not*–like in your newspaper or the pages of a novel–from cast or otherwise raised little elevations above plate level. This implies that the ink of the banknote is deposited upon the paper surface in a different way: The newspaper or the book print involves a flattening and at times a little squeezing of the ink, the banknote print is definitely (and in parts visibly) *on top* of the paper, in little piles, partially microscopic in height and partially pretty bold, though not nearly as bold as in diestamped matter.

When the printer has inked his plate all over he wipes the surface clean again and gives it an afterpolish so that the ink remains only in the engraved recesses. And only this remaining ink is used for printing! He presses his paper against the plate with sufficient energy to make the ink leave the grooves and adhere to the paper rather than to the plate when the paper is finally lifted away again. And as the broadest and deepest grooves of course contain more ink than the flatter and narrower ones it follows that he obtains *differences in thickness of the layer of ink* upon his paper. Such differences of ink will never occur in any ordinary printed matter of everyday-life. In books, newspapers and magazines the ink is merely rolled across the raised points of a printing block and the layer will consequently have the same thickness all over whilst the picture is formed solely by the variegated sizes and shapes. Or the ink may be rolled across the entirely flat (one-level) surface of some lithographic plate, where largely the same thing takes place with a still more pronounced uniformity in layer thickness.*)

The Banknote Original

the security of rare professions

Printing from engraved original plates is well suited for banknote use for the simple reason that the process of print engraving is so rare. Outside, in the private printing trade it is by now in the twentieth century almost non-existent, and in most countries the artists and craftsmen, as well as the machines and further associated plant equipment are to-day by and large exclusively found inside the confining walls of security printing works. The original plates are made by a number of people who beyond their innate talent have acquired most of their training and vocational education in these extremely specialized fields entirely within such walls.

The original plates for the main print of our banknotes are made of steel. And the different items of their design are done by different specialists of which one will not be able to do the next fellow's job. Certain parts are engraved free hand, others are engraved under the microscope following precise and very exact drawings, others again are created by means of highly complicated and very expensive machinery that is, likewise, accessible only inside the walls and is guided by codes and/or adjusted by master plates that are also well guarded inside the walls.

free hand engraving

Among the various items of a new banknote the one that draws immediate public attention is undoubtedly the picture. This picture is, at any rate as far as the front of the note is concerned, nearly always a portrait, in some countries engraved on copper and in others on steel. And the picture is one of those features where the artistic difference in character between the print of banknote engraving and the previously mentioned die stamping is most manifest. For even when the originals are engraved in steel their affinity with "la taille douce" is plainly apparent: their evident artistic ancestry is the noble tradition of classical, soft copper plate engraving and bears no resemblance whatever with the rigidly sharp definition and exuberantly raised embossing of the die stamped print that stands out so proud, hard and brilliant upon its paper surface that occasionally it takes on an almost polished look due to the tremendous embossing.–The banknote picture, however, is engraved on a steel plate of unusual softness, slowly and patiently. If you scrutininize such banknote engravings through the magnifying glass you will see they are made up of numerous little lines and dots, some of them plainly and some of them barely visible without the aid of the glass, each single one of them formed by the ink that has been "lifted out" of the minute grooves and cavities the engraver has incised into the steel surface. His graver, or burin, has been urged down, slowly and carefully in each and every one of them several times in order to give the isolated, individual dot or line its proper shape, size and depth so that the multitude of them will eventually form the printed image that we see on the paper. In between doing the actual gravings down into the steel the engraver must occasionally stop and burnish or polish away the small scraps of surplus material he is constantly raising. Like a ploughman's share is throwing a corresponding wall along his furrow the engraver's burin throws a little raised edge of steel, called the burr. And the burr has to be removed meticulously as he goes along. Otherwise the ink would stick not only to the furrow but also cling to the burr and make it impossible to obtain those clean-wiped, uniform prints that are essential because the banknotes of one country and one denomination should preferably be absolutely like one another down to the last detail!

This differs fundamentally from certain forms of the art of line etching for instance, where you print with the groove *and the burr as well,* and where consequently the prints pulled are individuals that have to be inspected and approved by the artist, print by print, and then certified by his signature and the respective sequence number, accompanied (below a fraction line) by an indication of the gross total number of prints pulled until the artist declines to go on and he either refuses to sign further or flatly annihilates the die because the prints no longer please him. That kind of procedure would of course scarcely be applicable to banknotes!

So the finest aspect of security- or banknote engraving is its close relation *to la taille douce,* i. e. that it is *not* similar to illustrations as seen in books and newspapers where the tones merely represent the final effect of masses of smaller or larger dots in a regular system of dispersion caused by a netted screen, and with the same layer of ink thickness all over. In the engraving the lines and dots forming the picture are the engraver's personal touch, his individual style. The shapes and depths of these variegated lines and dots, engraved in the steel, constitute so to speak his personal, slow and elaborate "handwriting" in the material. According to his particular kind of and degree of talent and temperament he puts down his own, individual system of lines and dots, thus giving his interpretation of the portrait personality or the landscape, the animals or the figures in question. He creates the shapes of the face, its anatomy, the kind of light falling upon it and all the intricate and evasive subtleties of the tricky portrait likeness. The hair, the clothes may be treated with great variations in the curvatures, the straightness, the boldness, the fineness, the spreading, the density, the shallowness, the depth, the smoothness, the grain: The effects of tactility, textures and illumination, whether soft or sharp. here is an entire language in its own right, of rendering images of material shape, of atmosphere and of mood.

And in general it is of paramount importance for the pictorial effect, and for the spectator's perception that these structures, minute and fine as they are, should not become too dense, too minute and too fine. Viewed at normal reading distance they should allow for their structures to be perceptible. They should enable the beholder to descry these engraving qualities, perhaps unawares but still as a sub-component to his perception of the picture as a whole, he should be subjected to the delicate and variegated textures of engraved line structures. Admittedly the average man-in-the-street is not likely to appreciate such graphic qualities consciously, but their effect should enter clearly as a constantly repeated by-effect. Whenever you look at a banknote, the hand engraved character should be just bold enough to be perceived, not in a disturbing but in an enhancing way.

Some countries have even gone so far into this that several engravers work upon the same picture, either so that each of them finishes his picture and in the end the best is chosen for final use, or so that they work in turn upon the same steel plate: one doing the face, another the hair, a third the background and a fourth the dress and so on.

So the portrait has become one of the most important features of free hand engraving. Of course there are lots of banknotes without portraits. But the quite specific virtues of portrait engraving for security purposes were already commonly recognized at an early stage. Very small deviations from the original line and dot structure count immensely to the forger's detriment. Such tiny changes play a far more decisive rôle in the portrait likeness and in the facial expression than similar changes in the lines and dots would do to

*) Printing as a whole can be segregated into three main categories, according to technical principle.–Popularly one might define them as "deep print", "high print" and "flat print" characterized by the ink-bearing (or: picture-bearing) elements being at, respectively, a deeper, a higher or an even level as compared to the rest of the plate (the non-printing part). For banknotes the main printing usually is "deep print" (the professionel term is *intaglio*) the background tints of banknotes are mostly "flat print" (professionally termed *litho* or offset). Numbering is always, and signatures are frequently "high print" (professionally: *letterpress*).

the likeness between, say, two representations of the same landscape.

This is the reason why many countries have adopted the portrait as an established part of their banknotes, and stuck to it over the years. Even when conventional viewpoints of paying homage to celebrities or humble reverence to heads of state et cetera do *not* enter into the choice you will still find the portrait engraving is being maintained as an important item of security graphics.

This rôle of great consequence played by freehand engraving, and above all by the portrait, you will find treated at some further length in the little chapter "Of Portraits and Engraving" printed upon the insides of the cover.

Marvellously eloquent scratches of engraving, depicting animals and hunting scenes have been found upon pre-historic bone splinters. This tells us that the origins of freehand engraving must lie very far back, and in the present context there is scarcely any reason to delve deeply neither into this nor into its later history. But in its relevant form freehand engraving, as we are dealing with it here, had some of its roots in the art of mediaeval and renaissance jewellers, goldsmiths, swordsmiths and gunmakers who embellished their creations by chiselling, chasing or graving motifs of ornament or decoration upon blank surfaces of metal et cetera, and the *niello work*, attributed (almost certainly without justification) to Master Finiguerra of Florence, consisted in filling-in the various grooves of engraved design with the black sulphur compounds of the metals. From there to the idea of using inks instead, and then to pull proofs is no large step in line of thought. The idea would seem pretty obvious. Only few paper prints by Finiguerra have, however, survived till our times.

So engraving is an old craft, and already since early renaissance times "line-manners" (or merely "manners") have developed steadily and become traditional means of representation for various pictorial parts. And they have since, especially during l'ancien régime and French rococo reached an apex of perfection and virtuosity that still commands our admiration.*) Otherwise, within the realm of art these "manners" have not always been of unmitigated advantage. Many are the mediocrities of engraving that have been turned out from famous paintings, dutifully "hatched through" according to rules and drab, traditional "manners" and landed up as non-entities of book plates or framed conventionalities hung upon walls.

But within the province of security engraving these "manners" have instituted themselves and grown into a distinguished and inspired discipline in its own right. In spite of a common trend of decay over the last decades these line manners do occasionally emerge in their full range of virtuosity: Clouds, water, trees, bushes, house walls, metal surfaces of armour, tools and machinery, corn fields, lawns of grass, drapery, textiles, human skin, animal fur, and bark of trees have over the centuries acquired such more or less defined or habitual "manners" that are employed whenever they occur in engraved representation, often with an astonishing and downright masterly effect of material suggestiveness. The relevance of this, the actual importance still, of maintaining these effects, in an inspired, non-stereotyped and personal way is evident when one considers how these various tactile values are commonly rendered in the ordinary daily techniques of reproduction where they are usually transformed into (and often degraded by) the industrialized hatching of common screen photography, trivially dispersed in regular ink points that of course can never approach the subtlety and precision of first class engraving of such "manner"-descriptions of material characteristics.

Perkins

Swordsmiths, gunmakers and artists had engraved in iron and steel for centuries, but the idea of engraving original plates for banknotes in soft steel instead of copper was introduced well over 150 years ago by an American, called Jacob Perkins whose gifts as a craftsman were rather unique. Within his field he was a sort of belated renaissance genius, slightly reminiscent of Cellini, Giambologna, Verrochchio or any of the other doughty Florentine metal craft wizards. Like those he was originally a goldsmith. He belonged to the generation that came directly after the one of the American revolution, the one whose military looks and behaviour had been so utterly and almost touchingly unprofessional that the British with some derisive mixture of overbearing and haughtiness had

*) To British readers the recurring term *"manner"* may perhaps now and then have a slightly awkward ring. Nevertheless I shall persist in using it, in inverted commas, denoting the various "linear styles" or "formulae of linear representation" as used by the engravers. It is important to stick to one label for this concept, as f. inst. the French talk of "la manière" and the Germans of "die Manier". So whenever the word occurs within citation marks, it should be taken in the sense an English art critic or art historian would use it when speaking of "the manner of Goya", "the manner of Rembrandt" et cetera. It has a much more literal or factual meaning than "style" or "form". For instance the illustration no. 17 could well be said to be "in the style of Tiepolo", but certainly not "in the manner" of him! He would never have had the patience to do these shrewdly calculated and carefully planned linear "manners" that (security-wise) are so decisively important. So *"manner"* it is, throughout the entire text!

called them the Yankee Doodle Dandies. Later when the military doodle dandies had prooved quite effective and derision had turned into respect they adopted the Yankee-label for themselves with a sort of mocking pride and self-assertion after having formed a recognized and respected union of brand-new republics and signed A Declaration of Independence.

And Perkins was typical of the age that followed immediately after. He was one of those lucid brains of the North American prolongation of the Age of Reason, and like so many of his contemporaries or near-contemporaries he flung himself with the dynamic zeal of the period into many a quest. Perkins embarked upon several schemes, most of them pertaining to security graphics, and to a series of problems within this field he found many solutions that have remained sound and valid to this day. He devised methods and lines of thought that are still alive, though of course many of them have eventually been brought up-to-date in modernized and perfected versions. He was a pioneer, but by no means an artist. His first contribution to the proper making of banknotes was to introduce the method of sorting-through large deliveries of cheap, soft steel in order to select from these huge piles the meagre percentage of the total, that was really fit for engraving, i. e. sufficiently homogeneous and flawless for use.

The common use of copper was discontinued, and exquisite works of original engraving were carried out upon finely polished surfaces of this second or third class, but literally selected quality of steel. *Because, after completed engraving, these hand picked plates of soft steel could be hardened.* And by doing this he achieved three fundamental advantages in security printing:

1) The softness of the steel allowed him to preserve all the essential virtues of *la taille douce,* its boldness of broad and deep lines and its gossamer clarity of fine ones, its virginal artistic qualities, i. e. the free and easy travel of the engraver's burin in the mellow surface. His uninhibited, personal cut, now applied to a material that could afterwards be tempered into a degree of hardness that was far superior to that of any earlier material for delicate cutting.

2) He achieved that the former maximum output of 5,000 good prints (before the copper plate was so worn-out that it had to be retouched or simply re-engraved) now rose to a safe average of 30,000 good prints from the hard tempered steel before abrasion started to show.

3) This idea led to his crucial invention, *siderography.*
Siderography is the process that among professionals is usually called "transferring". Like all good ideas this one sounds simple and straightforward, but in practice it takes considerable skill and great intuition for true craftsmanship if perfection is wanted:

transferring

—Now imagine the hard flat steel die with the finished engraving upon it, much more subtle and delicate in its ease and precision of line work than it would ever have been possible to engrave it had the material been hard in the first place. And further, lying on top and right across this hard surface imagine a roller of very soft steel, in principle very much like the baker's ordinary rolling-pin, only reversed in hardness: Instead of the "dough" being soft and the roller hard it is just the other way round! Now, by means of a very strong machine, called a transfer press, you start rolling. Under firm but very well controlled pressure you roll repeatedly forwards and back again across the flat surface with its engraving, be it a picture or some lines of lettering that are recessed into the unyielding die.

This must be done thoroughly, with much care and understanding for the nature of the job. The broad and bold strokes of engraving as well as the tiniest little almost superficial ones must, each single time the "rolling-pin" passes across, meet or "hit" the hardened plate in exactly the same spot, leaving its little mark, and thus slowly and gently the engraving produces little raised protrusions upon the cylindrical surface of the roller. Each little top or ridge corresponding precisely in size, shape and height to the sizes, shapes and depths in the original engraving. This must be done slowly and many times, back and forth, back and forth, many times, until you are completely "home". It is a good deal more complicated than it sounds. It must be done with an intimate and never-faltering intuitive feeling for the degree to which the metal can be strained right now, i. e. what each item of engraving can stand at any given moment of the proceeding. In some places, where the engraving is deep, quite an amount of metal has to be moulded into place and elsewhere only very little should be moved. And this should, all of it, take place in such a manner that the roller itself does not loose its correct and precise, axially true, cylindrical main shape. It is fatal if you "go oval", and you must land up with an utterly true, but *mirror-turned and raised* representation of the engraving, now sitting proud upon the curved, blank surface around the steel cylinder.

—And this roller, with its raised pattern, can now be hardened.

And with this, now hard and resistant, roller of steel Perkins could next repeat the process, with the

same meticulous care, but this time reversed: *From* the curved surface onto the many flat steel plates, that were subsequently hardened and that, *each of them* represented its 30,000 prints—of the same engraving, so that the banknotes of the country became identical and acquired a hitherto unknown look of absolute uniformity in print!

Since Perkins' times modern technique has naturally developed numerous improvements and still finer methods, but the school of thought, the idea of his principle is still the same: The soft, original engraving in sharp, identical reproduction and in such large numbers of prints, that it would have been simply impossible before Perkins' decisive contribution to security graphics.

but all the perfect techniques are not enough

He found many other solutions to graphic security problems and it would take us too far astray to mention them here. But in the circle surrounding him there were several other people of consequence and of initiative, like for instance Murray, Draper and Fairman in Philadelphia who found that all this technical perfection alone was not enough: An elevated artistic standard, a direct and personal expression of high merit, as art and as craftsmanship, seemed to them to be of at least equal importance as all the technical mastery. One single scallywag, one clever, but morally corrupt professional, an engraver of criminal disposition *might* imitate the notes very meticulously and pull a few thousand prints for a strictly private edition, in copper or steel. The paper print wouldn't tell which. And in those times there were graphic engravers galore! Alone in Europe and America there were thousands, whereas nowadays there are but a few dozens in the entire world!

So the three men in Philadelphia felt that only the very best, the utterly few hand picked top people among engravers should be used for banknotes. And they advocated to let these engravers really "have a go" at their discretion, anomymous if so wanted, but decidedly personal, direct work upon the original steel. They introduced their idea, and made their point, in the noblest possible way: Simply by designing and engraving some of the finest and most elegant banknotes that have ever been made. A three dollar note from Philadelphia Bank 1814 will cause joy and admiration in any true lover or devoted connoisseur of The Noble Art of Engraving even to-day, 160 years after its creation, and it would not at-all be susceptible to abject "repetition" by some jailbird who happened to be a professionally trained engraver, even with a considerable amount of connivance and industrious toil.

Asa Spencer

Another outstanding figure within this circle of worthy descendants of the generation of Benjamin Franklin and Thomas Jefferson was one Asa Spencer. His contribution to graphic security proved in its way as important as those of Perkins' and is still seen upon the banknotes of practically every modern country all over the world. And yet in the strict sense of the word he did not really invent anything, but he felt a deep admiration for the refined rulings of beautifully organized line patterns as engraved by the old instrument makers, predominantly French watchmakers, upon dials, lids and capsules, where intricately curved designs of linear arrangements in subtle geometrical compositions often adorned the metal surfaces. And his admiration for their results gave him the idea of employing this kind of embellishment, *le guillochage,* for banknotes.

If one were to cultivate and refine their simple apparatus of old, one might develop it into a greatly involved and highly perfected piece of machinery, and should thus be able to achieve line ornaments of an advanced mathematical perfection and regularity that could not possibly be copied or imitated, let alone repeated, with sufficient similarity, unless you had an exactly similar machine and knew how to use it.

He constructed a "Geometrical Lathe", that has next to nothing in common with a lathe, but more with some ingenious gearbox containing a multitude of horizontally layered, mutually eccentric discs whose movements are guided by gearwheels and other systems of transmission, all combining into one awe-inspiring co-action of interrelated movement. It looks complicated because it *is* complicated, but the purpose of it all is to govern the ultimate, curvilinear resultant, i. e. the utterly precise movements of a little original steel die against the point of a stationary diamond tip or extremely hard steel point fixed right on top of it all, pointing downwards against the die, thus cutting into it a line that mathematically describes the complex movements of the die as it turns and winds horizontally under this finely engraving contact point.

By means of shifting the various gearwheels and by adjusting various members of the transmission systems, as well as by altering the shape and place of the point these patterns of lines can be altered in literally millions of ways and thus produce pretty nearly an infinity of variations in design. But every single one of them will be law-bound, mathematically predicted traces, exactly reflecting this pre-setting of the plate and of the machine.

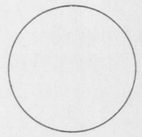
Of course the simplest thing you can do would be to bring all the eccentric discs upon one common

vertical line as if you straightened up a pile of saucers in dead center right below the diamond point. If you now fasten the original steel plate upon the topmost disc, lower the diamond and start the machine you will see your original plate rotate around itself whilst the diamond engraves —one dot!

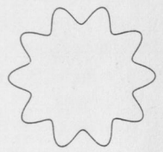
•

You are not likely to get much fascination, not to speak of a banknote pattern out of this. But now move, either the diamond tip or the entire pile of "saucers" ten millimetres to one side and start the machine again.

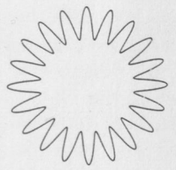
The pile, holding the top die, will duly rotate again, but this time the diamond will engrave a neat and perfect, needle sharp circle with a radius of 10 millimetres (and with its centre right where you had your dot in the first go!)



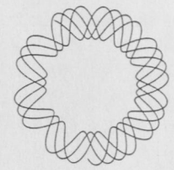
This little flawlessly engraved circle will scarcely be sufficient to cause widespread æsthetic exhilaration. So let us niggle a bit with the machine. We will let it run *almost* as it did. We shall only put one of the saucers slightly out of true center and give this one saucer a different, say ten times higher speed of rotation. And suddenly things will start happening: You will still get a neatly engraved, closed curve out of it. You may even make it run decently "back into itself" and join up exactly where it started, but the



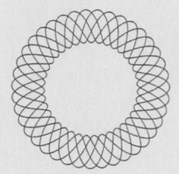
pure and tranquil circle has turned into a nice, regularly undulating line-trace, and if we change the speed of the awkward saucer up to double (so that it will now move 20 where it used to move 10) you will get the double amount of waves. If we push the axis

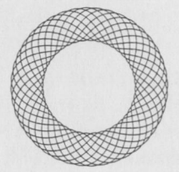


further out of vertical alignment with the rest of saucers, you will get much higher waves. And if we adjust it so that it does *not* join the starting point after one round, but instead make it, say, hit exactly one fourth of the circumference too far ahead it will keep running, folding into its own trace, precisely in and



out, into one series of interweaving, but strictly regular curves, all in one single line not hitting the point of departure again until the entire pile has wandered its course of rotation five times. But by then you will have a very nice and quite involved engraving pattern that would be completely impossible to engrave with such perfection by free hand.





Æsthetics of lathework

These were of course feeble attempts, merely to understand the principle. If we really "go to town" with the machine we can interfere with its course by long series of varied adjustments, i. e. we can use many different vertical axials for the interrelation of eccentrics, we may introduce new gear wheels for obtaining several speed ratios simultaneously and possibly even go to the length of insetting pre-calculated curvilineal master discs that gradually move the vertical centerline positions *whilst* the machine is running. And we may thus land up with patterns so weird and wonderful in their fabulous intricacy that they become almost impossibly entangled, abhorrently ugly, and so grossly beyond ready comprehension, that we might just as well have filled up the entire note area with a completely unplanned and unruled pandemonium of doodlings and whirls that would not interest a single soul, simply because we would have misused our theme by overplaying it (and this does occasionally happen).

—But if we just settle down composedly with the machine and try to concentrate upon using this expensive and fascinating toy in order to explore its æsthetic possibilities it would be a good idea to do

this in a spirit of artistic restrictiveness and disciplined care. You will then find it even more exciting than playing with some wondrous kaleidoscope. You are not restricted to repetitions of mirroring effects. The most marvellously clear and eloquently characterful graphic effects can be designed in line patterns of intersecting multitudes of curvelinear structures: Rosettes, undulating bands, underground structures, patterned friezes. Some can be dense and fine linear systems, some can be airy like gossamer webs, so that they print as a mere whisp of ink upon the paper. And these can, in the same printing plate, alternate with bold, open and distinct line systems that print in ostentatious, full-toned darkness of robust ink layers, and these varying degrees of strength can calmly glide into one another in superb, mathematically bound systems of crossings and arches, so readily perceptible in their delicate clarity, so eloquently and pleasantly variegated in their simplicity that no con-man, counterfeiter or palmer-off, would feel it safe to cheat the citizen that now and then—if only for occasional, idle moments—goes to the negligible trouble to pay a little attention, and possibly once in while even take to the magnifying glass for further familiarity with this.

white-line

It is also possible to "take up cylinders", i. e. use old Perkins' rolling-pin method and transfer such patterns down into the original plate so that not the lines, but the intermediate areas are recessed into the steel, thus holding the ink so that the lines themselves appear white, in clean paper, and the shapes between them stand out proud in dark printing ink.

The method in itself is somewhat more complicated than fit for description here. There are several intermediate stages to this process, but the idea of it all is to represent the pattern in white lines encrusted in ink masses. One of these intermediate stages is called "the white-line shell" and upon this it is possible to combine the white-line work with engraved figures or letters so that they form an integrated part in the pattern. The value of the note can thus appear set into the pattern design so that public attention is drawn towards these qualities in the same glance with which the value is recognized: In the moment of reading the figure your eye also reacts to the surrounding guilloche pattern qualities. This is of special importance in countries where the banknote designs are almost confusingly alike from one denomination to another. This likeness is often done deliberately, so as to introduce an element of compulsion, actually forcing the citizen to look closer and pay more attention.

The original motivation for this close union, the direct insetting of the value-figure into the guilloched rosette, was of course to render illicit amendments or "private improvements" of the value figure impossible. The Russians, the Chinese and the Czechs have taken this further still, inasmuch as they have developed systems of additional composite fine line work consisting of extraordinaryly sharp lines in minute little extra structures inside the original pattern. A structure within a structure. A surplus finesse that is built into the leading pattern of distinct, ink-bearing rhomboids of intermediate areas forming the white linear design of pure paper. The Hungarians and the Austrians are excellent in guilloching not directly into the metal but into a layer of lacquer to expose the metal beneath this so-called *etching ground*. The work is eventually bitten into varying degrees of strength so that the final outcome are lines of subtly variegated depth into the printing surface. Asa Spencer's fine old idea has developed into a complete æsthetic language of its own. (During the last couple of decades several contemporary artists have achieved some interesting and beautiful results—entirely outside the field of banknotes—by making figurative works of modern art by means of advanced electronic apparatus.)

pendulum-guilloches

Barely a couple of decades ago an English expert, Victor Helps, returned to an old idea of creating guilloched patterns by way of a different principle, the so-called pendulum method. A detailed description of this would presumably take us too far, but his mechanical solution to its innovation was of striking technical elegance.

But the artistic exploitation of this type of guilloched design has, however, been rather problematic. These freely swung, asymmetrical curves do have characters of their own that have not, so far, found their artistic master and ruler. In fact they have caused little more than an epidemic spread of superficial brilliance that does not convey the initial motivation and proper purpose of guilloche design with the same forceful eloquence of simplicity, clarity and perfection to the perceiving eye of the public as did the old ones. So far this renewed type of design has, in many more recent types of banknotes, made itself manifest merely by filling-in a certain amount of the print-area with modish looking furnishings of grandly outspread masses of deft and elegant skating-swirls

and other affected manoeuvres that look tremendously smart. But they all suffer from one fundamental weakness: In spite of their being widely differentiated they all look alike! Two minutes after having seen one of them upon one note, you would readily and without hesitation accept another note of the same type, but with an entirely different guilloche design, if anybody went to the trouble of pulling that kind of practical joke. This has a very serious aspect for further thought.

For this reason many of the countries that are most advanced and conscious in these respects have stubbornly refused to "go modern", but have pointedly maintained the guilloches of old with a certain, and well motivated, conservatism: A simple and forceful character of outline and an elementary and clearcut structure in guilloche design so that these elements are "right bang in the eye", and that their pattern, however complicated on close scrutiny, is a readily perceptible and familiar retinal impression to the public, but achieved in such ways and with such quality that spurious imitations would alert attention or at least inspire uneasiness or scepticism. So even in very advanced and modern countries you will often find guilloched elements of quite simple and traditional symmetry, because symmetrical patterns in themselves offer natural, mirror-turned fields for critical comparison of uniform repetition and unwavering quality in the linear work.

Prevention of Counterfeiting

But let us return for a while to the tender years of the new-born communities in North America where many little private banks issued banknotes of their own. Under such, yet comparatively unstructured, circumstances with immigrants industriously erecting homesteads and cities, establishing common institutions, founding new firms and further accessories of commercial life, in short creating the outlines of a nation, there would of course be other newcomers who felt more like emigrants, like social refuse of frustrated origin, be it morally or economically. A sprinkling of criminals was bound to be among them, recklessly playing the chances in this turmoil of evolution.

And counterfeiting of banknotes was not a mere nuisance, it grew into a precarious and widespread menace, creating uneasiness, grief—and also a lot of trivial bother. Obstacles and delays in business life and daily trade ensued, and this was all too fertile grounds for confidence tricksters, fraud and delusion. Organized police and other institutions for prevention and persecution of crime were scarce even in larger cities, not to speak of the countryside. The nearest sheriff or judge was usually a long distance away, so counterfeiters had golden opportunity and the defeat of their traffic became a major problem to the hopelessly under-manned authorities.

Not only prominent political personalities in these new republics but also the appointed officers of law as well as leading men in business life (and among those naturally the heads of issuing banks and their printers) were, like all progressive agents of this dynamic era, strongly proclaiming the heroic, newly lined-up Human Rights, the idealistic concepts of freedom and equality in the pursuit of happiness and all the so splendid words. Penal codes should be humane. Of course trespassers and criminals of all desriptions should be apprehended and punished wisely and effectively, but the proper way of defeating crime and fraud, as for instance counterfeiting, was to make their schemes and attempts so difficult as to be nearly impossible. The school of thought was to abolish crime by eliminating its grounds of approach, by raising the demands to quality beyond fraudulent capability and to spread public information and knowledge about these qualities.

In fact they started important aspects of the eternal race that has since been going on. The security printers had to be constantly some lengths ahead of even the cleverest of criminals. This was the contemporary background for the circle of personalities whose work within security graphics we have been outlining. And this is also the reason why we have dwelt on the historical side of the subject. Not so much for the sake of history, but more because the situation we find in North America during the latter end of the eighteenth and well into the first half of the nineteenth century does give us a short and comprehensive picture of the evolution within this field of problems. Already in 1809 the Perkins' methods were made compulsory requirements by law within the state of Massachusetts.

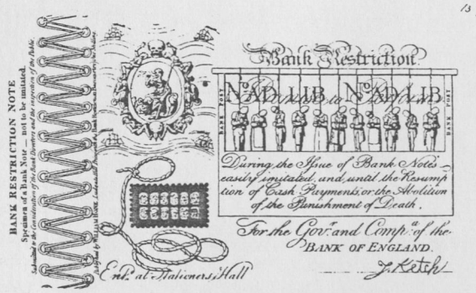
and merciless persecution of crime

Back home in the Old World, in the ancient countries of Europe, forgery and counterfeiting was also a problem of considerable proportions and had been so for ages. But for generations, as far as anybody's knowledge went back, the solid old and very well established State Authority methods of prevention had been in use: A counterfeiter was seized and punished so that you could rest eternally assured that he would never make any more false money.

It was a firm tradition with the authorities, since the Middle Ages, to provide entertainment by uniting spectacle, enlightenment and education of the people by boiling the local counterfeiters in oil at the Place

Maubert in Paris. The progress of the bright new Age of Reason briskly altered these proceedings: By means of the newly invented, scientific and humanistic apparatus of dr. Guillotin the forgerer's head was instantaneously and almost painlessly removed so that he would never be expected to make counterfeit notes thereafter. The broad, pedagogic aim of this was maintained and even more efficiently underlined by the fact that it was carried out at the much better theatre provided by the considerably larger new square in town that had so beautifully in spirit with the new ideals been named The Square of Harmony and Unison, Place de la Concorde.

Across the Channel, in good old England, they were not quite so up-to-date as to adopt these modern ideas, but the school of thought was exactly the same: Counterfeiters were hung in batches. Long rows of them were suspended from the mass gallows of Tyburn Hill, and left on parade, swaying in the breeze, as a memento and a reassurance to the good citizens of all London, that law and order prevailed and wrongdoers were properly dealt with.



The British artist George Cruikshank (of Dickens-fame for his illustrations) issued in 1819 his satirical "Bank Restriction Note", a very juicy affair signed by Joe Ketch, which was the contemporary pet name of the hangman. The £ sign is formed by the hangman's rope, looping before a jail-grill with a thronged mass of heads inside. Mother Britannia devours naked citizens of various descriptions. One is being gulped, and a row of others are awaiting their turn. Upon a background of ruled waves this scene takes place inside an adorning frame showing allegorical figures displaying eloquent gestures of sundry sufferance and convulsion, supported by a spider and crowned by a skull. The main motif, however, is the mass gallows at Tyburn Hill that was only too familiar to Londoners in its heyday. The cruel legend along the side pillars reads: "Bank Post", with infinite pun-implications, and the outer left hand side ornament looks like something sinister from the back of a strait-jacket!

The Society of Arts etc.

The snag of it was, that the rows in the gallows grew steadily longer, and of course everybody with some common sense left was aware of the complete lunacy of such persecution. But nothing happened until so comparatively late as in 1818, when the Society of Arts edited its *Report and Approved Communications and Evidence Relative to the Mode of Preventing the Forgery of Bank Notes.*

A committee had been set up to examine this entire problem, and experts were called in for hearing from a selected field of trades and crafts that were considered relevant. Many useful, and some quite peculiar, points of view were presented to the learned Society. The British ambassador to Washington, who had been following up closely upon the American development paid great attention to these investigations, and he saw to it that the foremost personalities within the previously mentioned American circles were invited to the Society's hearings. Fairman and Perkins and other men of prominent consequence in this went to London, and among the select handful of specialists accompanying them was also Asa Spencer.

In the final report they are but scarcely mentioned, or at-any-rate only very briefly referred to, whilst other contributions are extensively enlarged upon*), but in the decisive parts of the ultimate conclusion, notably in the second edition that came two years later, it is very clear that the advanced and consequential line of thought by these Americans had greatly impressed the committee. Without underlining their origin to any marked extent, the Society let these ideas form an integral and important component of the total outcome of this entire undertaking.

*) For their time many of these contributions were very well founded suggestions, and some were quite ingenious. Some of the measures proposed were intended to outline methods of obtaining non-repeatable effects that should, at the same time, be impossible to simulate. Others went for "the security of the overwhelming amount of work", i. e. that forgery perhaps might be feasible, but would necessitate investment of such amounts of work and capital that it would be out of proportion with the risk and the uncertain gain. Common to these lines of thought was the intention of blocking the forger's chances of "making shortcuts" by simpler means to a sort of mock-similarity, sufficient for the unprepared public to be taken in by at the short, crucial moment of the banknote passing from hand to hand.
A peculiar suggestion—yet in its day a very sound one—prescribed a remarkable use of typographic composing by means of letterpress type: There were only very few type foundries in England having craftsmen capable of cutting the smallest grades of printing type, like Diamond f. inst., and it was not considered possible by free hand work to imitate the effect of their letterpress print image if they were plate engraved instead of being, in the correct professional way, cut as punches, tempered, struck, cast, adjusted and composed before print. This involved an entire series of specialist's procedures and for this reason it was suggested to select the 4-5 absolute top class people among the existing specialists and let them cut and produce specifically designed type faces of these minute grades, exclusively for security use with the Bank of England. The Bank should for instance hold a well-guarded monopoly for italic type design in minor grades, that sloped the opposite way to the normal slope of italics! Such design should by stern paragraphs of law be expressly reserved for security printing purposes.
In their day such a security precaution would have been an immensely difficult, and both costly and riskly obstacle to the forger's task. A complete assortment of founts would take years and years, and would entail that still 3 or 4 highly skilled persons be initiated in the criminal scheme.
To-day these precautions are nothing but funny and quaint historical curios. Any modern prefessional craftsman in reproduction, of good or average skill, would jump such hurdles perfectly within little more than an hour's time!

The Bank of England followed up on this with extended schemes of practical research. Very impressive sums were assigned, and a further account of these endeavours would form a highly interesting bit of reading in this context, but would, however, also take us a bit too far afield here. In short: No positions and no commissions were offered to any of the American gentlemen that had appeared before the committee in London. And of course it is mere guesswork, maybe even of a somewhat base and insinuating sort, to hint at the existence of some lurking resentments against the idea of such offers being bestowed upon any shady offspring of the "Yankee Doodle Dandies" that had, not too long ago, committed the tactlessness of giving His, British Majesty's neatly uniformed soldiers a pretty thorough and decisive hiding. After all the American war of revolution and the Declaration of Independence—and the eventual Napoleonic wars were scarcely forgotten yet. And the idea of putting foreigners into highly entrusted positions might not have seemed too appealing.

continued refinement of original-techniques

Most of them returned back home to America. And Asa Spencer devoted the last two or three decades of his industrious life to continued development and refinement of his methods. Together with a couple of pioneers in this field, named Gobrecht and Saxton, he lent a hand in the realization of *relief engraving,* an invention that also was to become a widespread and esteemed feature of security graphics. And a well established one. You will, even in ultra-modern work, see it—still going strong—upon banknotes and securities from all over the world.

relief engraving

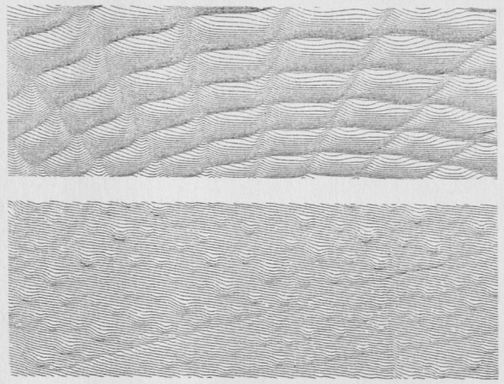
The origin of relief engraving lies in the fact that many larger securities (certificates, shares, bonds and so on) often bore the seal (a sculptured coat of arms or some nicely worked-out emblem) of the issuing firm or institution. This was often applied in lacquer or sealing wax by means of a *signet stamp* in reverse and recessed medal- or basrelief work so that, upon the document, they appeared right and raised. Saxton and Gobrecht were toiling with the idea of bringing this authentical relief on to the paper, in some way or other, as an integral part of the printed image. But the crux of the matter was that they wanted this to be a true and identical representation of the approved, original, modelled seal, not merely some new and repeated pictorical version in drawing or engraving with the same motive. It had to be the proper thing itself that had guided, mechanically, the exact rendering of every detail. They got Spencer interested as well, and together the three of them constructed and developed the apparatus that is now called the relief engraving machine. The principle they laid down is still fundamental in this type of work, yet the machines have naturally undergone improvements and modernization in their mechanical details, in easier modes of operation and so on, but they all turn out exactly the same kind, though not always the same quality, of security work.

Relief engraving is carried out upon a machine that is a paragon of simplicity. The principle is of noble technical clarity and the build should be of top class mechanical precision.

If you don't do anything to it, but just start the empty machine it will engrave a series of very precise, and very exactly spaced, parallel lines upon the surface of an original plate. But connected with the pin that holds the diamond tip there is a perching arm, a sort of pivot arrangement that during the run of the machine is governed by a stylus (or master-pin) the point of which is travelling along the surface of a precisely horizontal plane. (In the present "empty machine"-example this horizontal base serves as a plane straightrule, guiding the parallel course of the evenly spaced lines).

And now the crucial part: If you place a coin, a medal, a modelled seal or some other sculptured relief-work upon this basic plate, the master-pin will travel along its tiny hills and valleys, "feeling" the undulations of the sculpture in a series of parellel-running trace lines and via the transmitting arm these undulations will affect the parellel course of the lines engraved by the diamond tip. Thus the *vertical alterations* of the master-pin movements are "translated" into corresponding *horizontal alterations* of the diamond tip movements, and the lines engraved by it will thus be deviating from their pre-set parallel courses by alternatingly converging to or diverging from one another, corresponding to down-going or up-going guiding movements of the master-pin.

The final outcome of the engraving thus accomplished will be an optical impression of alternating line density that will form a reproduction in light and shade effects exactly corresponding to those of the sculptured work in the relief that induced the line-movements. So the spectator will behold an exact and authentic representation of the original relief, now transformed into a one-level graphic pattern of lines whose alternating intermediary spaces are direct resultants of the "undulations" of the sculpture-work itself. Really a superb piece of technical inventiveness!



Here are two small samples of work from the relief engraving machine. The upper one is a ground tint structure that has initially been ruled upon the guilloche machine ("The geometric lathe") and then, by way of a power pantograph, turned into a sculptured master relief that is finally used for inducing the mechanical line-deviations that are the characteristic feat of the relief engraving machine.
The pattern below has simply been taken from a hard cast of a flat wax surface into which the shell of a sea urchin had merely been pressed! These samples have been chosen solely in order to show the relief machine effect in a simple and comprehensive way. But the machine can cope elegantly with far more sophisticated master reliefs. Upon banknotes and other documents it is for instance very frequent to see finely sculptured coins and medals rendered with extraordinary fidelity in this technique.

Also the relief machine is a fascinating toy to play around with. The final image of a field of such lines engraved has a logical effect, as if it were the result of some specific "illumination", represented by fabulously exact hatchings. And this "light" will always look as if it came from a 90° angle to the main parallel direction of the lines. This means that the direction of this light can be altered merely by turning the relief in respect to the parallel main tracing direction of the machine. And in doing this you may obtain astonishingly varied results from the same basic relief, almost in the same way as a photographer or a film director can alter the mood of his picture by doing nothing but slightly altering the position of his sources of light.

lettering upon banknotes

Banknote lettering could easily turn into a very large chapter, and a thorough account of all its security aspects could easily lead us far afield were we to try to embark extensively upon it, let alone endeavour to exhaust it.

Lettering upon banknotes has in many (otherwise highly developed) countries led a miserable life of neglect, because public attention is commonly assumed to be more directed towards *what* is written than to *how* it is written.

The old Americans, the circle around Perkins and the others, knew already that this is not so. The designers and engravers of their epoch stressed the qualities of lettering as a very important point and they realized fully that the execution of the lines of lettering was of immense security-graphic significance.

To-day we must of course remember that many of their trends of thought were laid down more than half a century (or even longer still) before photography and photomechanical processes of reproduction had reached a stage of development that turned their possible misuse into anything remotely akin to a danger, let alone a menace in this respect. Forgeries in those days were practically always hand engraved or hand drawn ones. And yet the lawful issues of that time had lines of lettering upon them of a subtlety and beauty that would often render their imitation tricky and difficult, even to the most perfect of modern, sophisticated processes of reproduction.

Of course many of their ideas and details are now obsolete and have become mere curiousities. But quite a good many of the principles laid down by these people are still valid (some even of increased validity) in our times of advanced cunning in graphic reproduction, so it is often hard to understand why such viewpoints are frequently neglected in many countries to-day.

But nevertheless this *is* a fact: There are countries with highly developed traditions in security graphics where banknotes, bonds and shares are designed in exquisitely well-planned detail—and then, with a paradoxical and inexplicable nonchalance, they are completed with letters and figures that are totally devoid of security aspects and that could, without further ado, be sufficiently imitated by quite simple letterpress-, litho- or serigraphic means without leaving the general public the faintest chance of ever spotting the difference.

And then there are other countries where the characterful and subtle execution of lettering and figures

is a meticulously and carefully planned feature, carried out with fastidious and very distinguished, *and also very distinctive,* finesses of engraving, so that the lettering image in itself constitutes a real challenge to criminal attempts, fully comparable to those of any other element of the genuine original.

In the ways they are carried out, such letterings may combine free hand engraving and micro pantographed engraving (from large master plates of greatly specified original drawings) with guillochings and machine hatchings, where alternating depths, widths and densities of line work, and subtly variegated treatments of etching and burin work, can lend to these text lines a monumentality, an elegance or a calculated intricacy that would play a decisive rôle with the public in its more or less undefined, at any rate professionally uninitiated, daily feeling of inherent quality. Freudians of course would object to the use of the term, but popularly one might speak of a "subconscious" recognition of something either being *there* or lacking.

It is in fact not necessary for the general citizen to be *aware* of this. He does not need to *direct* his attention to such advanced detail of artistic intent, or of mere finery, in the image of textlines. Already the fact that these (to him undefined) qualities *are there* will affect the habitual, pre-set impression stored somewhere in his mind. And if suddenly *they are not there,* or if in some way or other they appear *in a corrupted form* he does not need to know exactly what alerts him to a closer look. The point is that he is alerted. And that a slightly watchful scepticism has interfered with his normal routine of trust and acceptance.

This belongs to the intangible realm of split-second phenomena within the crucial moments of a payment, and of course it is of special importance in countries where the average citizen runs a more frequent risk of paying dearly for not being observant. In such countries the public attitude is markedly more alert and vividly watchful than in countries where two or three forgeries a year are national events that hit the headlines.

The quality of engraved lettering forms an integral part among the other items of these security considerations, but further technical and æsthetic introduction in this special department would take us too far. However, among the illustrations later on, and the comments thereto, you will find a couple of gleanings and stray observations upon this intriguing field of applied perceptional psychology.

"needlework"

Under the general heading of "free hand engraving" there remains still one sort that has not been treated so far. It plays no significant part in present Danish banknotes, but it forms very characteristic components of detail ornamentation in the banknotes of many other countries. (And by the way it also played an important rôle in the early, noble art of copperplate engraving. It frequently covered large areas of partial work also in plates that for the main part were *taille douce*). This is *needle work engraving.* In actual fact it differs from other free hand engraving only by a needle being used instead of a burin, but as as means of artistic expression it is an entirely different proposition altogether: The needle is held in the hand, not like a burin but like a pencil, and consequently the lines are not created by pushing but more like drawing. The recessed lines result from the unrestricted, and often quite playful, free hand drawing with a pointed needle that only has to penetrate a protective layer *upon the surface* of the metal (a so-called etching-ground), and thus the tool can be used with great ease (without the resistance that controls, and restricts, the movements of the burin that actually goes *down into the surface*).

So the needle dances without hindrance on top of the metal, baring it by removing the etching ground. And the subsequent acid bite then creates a recessed line without any burr. The line has an inherent freedom and ease that may be further enhanced by alternating width and gradually varied depth of bite that lends to this type of engraving a certain character of traditional copperplate-etching that even the engraver himself would find it very difficult to repeat, almost in accordance with the fact, that you cannot write even your name twice in ordinary writing with complete congruence.

From a security-graphic viewpoint this was of course of far greater importance before the invention of photography, but the innate originality in this kind of work is still being used, though not to any predominant extent. (On US dollar notes it is sometimes seen applied for instance as a delicate little specialty here and there. The little vignette-ornament of laurel-leaves in the lower part of the frames surrounding some presidential portraits are, and were especially in earlier dollars, characteristic examples of "needlework", but this type of engraving may also occasionally take up large and important proportions of pictorial areas, even in engravings whose main parts are burin-engraved). So in this special respect security engraving as an art has its closest affinity to the old, established art of etching as practised for instance by Rembrandt.

flow-etching

Another, somewhat more remote, likeness with etching in gradated graphic tonalities has already been

loosely touched upon when the guilloches of for instance the Hungarians and the Austrians were mentioned. This gradated form of etching has its perhaps even more sophisticated use, where machine ruled layers of lines form areas of freely variegated flow-etching, as for instance in the background of a portrait or in the clouds and sky tones above a landscape, where the varied dosage and duration of the acid application is administered almost in the same way as a wet watercolour brush can yield fleeting or hazy atmospheric effects and aerial perspective when travelling, soaking wet, in freshly applied colour that is also still wet. Those who know Chinese brush pictures or perhaps even have personal experience in watercolour painting will be entirely familiar with this. And so a completely analogous effect is obtainable in engraving and print when a machine-ruled line tint is etched by a really shrewd artist. The effect of the free flow of etching, combined with the strict and disciplined ruling that "carries" it can be very unique. The old Americans and the private British firms were true masters in this, and some of their finest works over the generations display brilliant detail achievements, for instance in portrait backgrounds where this is done in a free and picturesque way, at the same time permitting the flawless regularity of the "carrying" line structure to play its rôle, both to the naked eye and through the magnifying glass. It should be evident without further explanation, that real counterfeiting of this, even by ultra-modern means is pretty nearly impossible. And therefore such features are still of great significance, even in the very best of modern banknotes.

The Ink of Banknotes

We have deliberately gone rather well into all these properties of the engraved original plate before embarking upon the question of *banknote ink*. There exists a very close link here that will be better understood when the complex and variegated character of the engraving is born in mind. Likewise it should be remembered that the *main print of banknotes* differ from most other printed matter because the latter *has little or no inborn difference in the thickness of the ink layer.*

When you apply colour to a sheet of paper you may do it in several ways. One is to paint it as you would paint a piece of woodwork in your house, for instance a door. You would do it carefully, paying attention to making it nice and even all over, so that the underlying surface is covered neatly and the layer is pleasantly uniform, without lumps or partial thickenings and without omissions and thin or transparent parts blemishing the job. And if you *print* the colour upon the paper you would normally take exactly the same kind of care. In most kinds of printing technique this is *the* most important sign of quality.

Surely you are familiar with the irritating nuisance when a page in the newspaper has become nearly illegible because of accidental lack of ink supply. The clarity of the press photographs is fundamentally dependent on the clarity of the printing plate, i. e. the correct size differences between its thousands of tiny screen-dots that form the picture. But this implies as an indispensable condition that *the ink itself is perfectly even and uniform all over the print surface.*

This also applies to the patterns of underlying ground tints etc. upon the banknote. These tints are usually offset or letterpress print. *But it does not apply for the main print, because the main print is direct, plate printed engraving.* And the hallmark of quality here is that the ink is *not* even. The characteristic distinction of engraved work should be enhanced in printing by letting the various depths of engraving come truly to the fore in correspondingly gradated layers of ink thickness in the print.

If for a moment we return to the sheet of paper that we were just trying to paint with a nice and even colour, we might now imagine another sheet. But this time we will try to paint upon it with watercolour (like the box of watercolours that we all remember from our childhood). This kind of painting is entirely different. No uniformity is wanted. The proper use of watercolour is to play with its different degrees of transparency, so that in some places the paper is plainly visible right through the colour, and in other places only more or less visible, according to the amount of colour we use in the various areas. We may also in places use such strong layers as to cover the paper entirely (by applying a layer so thick that the colour becomes opaque)—and we may even do this so boldly that the thickness of the layer can be directly felt with the fingers.

Any colour of printer's ink, a red for instance can be influenced in the same way, so that it is seen to become *darker* without really changing its colour. What happens is only its becomes *denser*. This only means you can no longer see the paper through it, and so the colour is seen darker without really being so. It is still from the same pot of red printer's ink, only now in a deeper, more strongly covering layer of the engraving than in the more lightly engraved parts where the coloured lines can lie like gossamer threads, like a mere whisp upon the paper. And then in places the engraving can be so extraordinarily deep that the ink stands out proud and its colour often turns into

an almost black degree of darkness. But it is still the same ink, still the same colour although one would often hesitate to believe it.

If you realize the true significance of this difference in thickness of ink layer you will also realize that the already so abundantly stressed nature of the engraving's variegated depth fits hand-in-glove with the purpose of letting the ink of the main print display this "watercolour-vividness" of changing tone values due to the varying covering strength of differing thicknesses. The many finely adjusted variations in depth of the engraver's lines and points are represented with a fidelity and intensity you will not find in any other method of printing. But the ultimate outcome of it all is naturally closely linked, both artistically and technically, with a very deliberate engraving—*and* with just as deliberate a choice of the ink used. This ink must be formulated and manufactured to let these features have their right and proper emphasis.

and their "colour"

So the colour choice itself, i. e. the decision on what hue to settle for in any given case is intimately linked up with the character of the original engraving in question. But then you will also find this choice subjected to technical and security-graphic points of view, and it is by no means certain that the artist can always have his fancy. There will often be restrictions in sundry drab and disillusioning ways of dire industrial production-necessities.

Both for practical and for security reasons the colours must be related to one another in given and definite ways, and this is especially true for the ink of the main print, because as we have just seen, the main print has (in a direct and literal sense) one variable dimension more than the other inks, namely in its gradation, its "Stufigkeit". In this special respect some security people have even gone to the extent of developing inks that actually change their spectral hue with changing layer thickness, so that the same ink may for instance be dark brownish in deep parts, but change into blueish red or orange hues in shallower parts.

For security purposes this interesting augmentation of the spectral range of one ink will often be a very valuable addition because the outcome, i. e. the effect in the final print, is so directly linked with the proper original engraving *and* with the correct prescription for the ink in question. Æsthetically this can also be of great effect in lettering, guilloche work and others of the more "disciplined" parts of the engraving. But of course for the pictorial parts (the free-hand engraved vignettes, portraits etc.) the use of such inks must be discreet, because if you make the "colour-shift" too predominant, its effect upon the pictures may occasionally be unfortunate: not all works of art readily lend themselves to what are sometimes rather gaudy representations.

Finally some countries have developed printing techniques where various parts of the engraving are inked with various colours but printed in one go, so that some parts of the main print appear in say violet whilst others are green and still others yellow and so on. Upon the, otherwise excellent, Yugoslav notes this has been used, straightforwardly for colouring the landscapes in their "true" colours, so that the houses in Dubrovnik are standing stone-yellow in the sunshine against a deep blue Adriatic Sea and beneath an azure blue sky with green foliage of trees in the foreground! Such outspoken frankness does, however, at times make the gay colouring deflect or distract attention from the true virtues of engraving that, all in all, should be regarded as of more essential importance than the colouring. But admittedly you may at times encounter quite successful, even shrewd and rather elegant applications of this (in the security sense not very useful) procedure, *the polychrome, localized inking.*

an intermezzo on mezzotinto

But (for real security-sports!) there is one other, refined little curio that decidedly deserves mention. You will neither find it on Danish nor on any other western banknote. This is the partial use (inside secondary fields) of the old and distinguished *mezzotint technique.* (Once in high esteem for making entire pictures in what was then called "the English manner", Richard Earlom, Lucas, Turner and others—and despised by Blake!)

The application of mezzotint to security printing has reached perfection within the (also in every other respect) highly developed security graphic traditions of the Russians and the Czechs. And masterly versions of this can also be seen upon the modern Chinese banknotes.

The short interlude about this technique has been inserted here, right in the middle of the ink chapter because the aim of mezzotint as used for banknotes, is to display the variation-effect of the same ink in two or three degrees of covering strength according to clearly gradated steps in deepness within areas of tint or pattern structure.

These delicate variations in depth can give a discreet nuancing to structures that are otherwise uniform. And the mezzotint may also be used in two mutually interwoven patterns with a slight, deliberate "clash" or interference between them, due to a faint discord in their respective pitch. This produces a peculiar, and virtually non-repeatable, effect of very

high security value, not perhaps so useful to the public but resisting the attempts of undesirable experts to copy it! Viewed from a normal reading distance it is often somewhat reminiscent of an exceedingly fine straw plaiting, but inspected through a strong magnifier you will discern two tiny little, and incredibly precise, systems of stars or circles in two clearly segregated degrees of depth, whose variance however is microscopically minute, but most decisive for the correct appearance of ink in the printed image.

This mezzotint effect may also, as a further refinement (*and* a further complication) be used inside areas of guilloched white line work, where the various solid trapezoidal intermediate tablets will then appear in two or three distinctly differing degrees of covering strength, and this can occasionally be of really decisive consequence, even to the way the pattern appears in the public perception. Such advanced technical qualities, when combined with subtly formulated inks are capable of producing effects that are extremely difficult to imitate. And here we are: Back again with the ink that has to be prescribed and manufactured so as to play an active part in the æsthetic effect of the final print of the engraving. *And* so that any spurious imitation, attempted in other printing techniques will instantaneously look coarse and "not quite right".

more on inks—the technical requirements

But apart from the points mentioned, æsthetically and security-wise, there are of course demands galore that the banknote print chemists will have to cope with when brooding upon their clandestine prescriptions. For the fate of a banknote is manifold and capricious, and can be quite rough. If other printed matter becomes too worn, you crumple it into a ball and flick it nonchalently in the direction of the wastebasket. Or you fold it carefully away for filing behind locked doors of a cabinet. Or you weight the sheets, and perhaps you press them lovingly before having them framed and sealed behind glass and hung in your your stateroom.

You dont do that to banknotes. They lead harsh lives: A banknote may be forgotten in the pocket of some piece of clothing that is pressed with a really brisk and hot iron after a thorough washing—and then hung to dry upon the radiator. Or it may be found in a safe that is lying about, still some hundreds of degrees hot, in the embers of a burnt-down house still aglow.—A garage attendant, a fishmonger, a blacksmith has honest dirt upon the fist he is clenching around it when paying or changing it. A farmer loses his well-lined pocket book when leaning across at foddering hours. The sow is butchered with the speed of lightning in order to save the precious contents at the last minute. A gentleman at the bar has lost control of the finer movements in the latter end of the evening, and the last dry three-finger one topples, right across the currency meant for payment. A body washed ashore still carries a wallet, after three weeks of salt seawater. The ways of money are such that passeth all understanding.

And for banknotes you will find that Hans Christian Andersen was wrong for once in his fairy tale of The Top and the Ball with his sad observation on the nature of love. It is *not* true (as you have it, in professor Keighwin's masterly, *almost* perfect translation) that: "Love is bound to fade away when your sweetheart has spent five years growing sodden in a gutter. You can't be expected to know her again if you meet her in the dustbin." If the fate of the top—or that of the ball should befall a Ten Pound note you will find that love is still burning with its eternal sincerity when the loved one is fished out of the gutter. Even the pitch-black, carbonized and shrivelled contents of an ash pan or a bucket will (when examined under the microscope—*and* when not disturbed) show the flawless, but incredibly diminished, imprint of genuine engraving till the very second it falls together and vanishes into dry, black dust at the lightest touch of a knitting needle!

Oh yes! The printing inks for banknotes would form a large and tricky chapter were we to exhaust it. The chemical engineers of security printing works are confronted with quite a lengthy series of requirements that one wouldn't dream of in inks for ordinary purposes. The chemist formulating the inks must consider not only its resistance against sundry vicissitudes in the life of a banknote, but also to a marked degree he must observe the way it is born. Banknotes are printed rapidly. Their ink must dry quickly, not to smear the neighbour notes. Also it must wipe flawlessly, fill the grooves of the engraving in a well defined way, and leave the surface blank between the sharp cuts of its lines. Its ingredients must be constantly available over the years, regardless of shifts and changes in the conditions of commercial life. It must needs be produced in exactly uniform quality for years and years. Perhaps it has to contain certain forms of traceable material, perhaps it must blend in specific ways with other inks of the note, perhaps it must fluoresce in definite ways when subjected to ultraviolet or other radiation. It must show high degrees of fastness to light. It must be resistant to an even very robust dosage of washing detergents, to alcohol, to sinister alchemic brews of inexplicable origin, to greasy matter, to various rinsing solvents. It should be able to survive months of rubbing against coins or leather, and a lot of further challenges of daily life where even Andersen's fairy imagination would be insufficient—and still it should in its more

or less harassed and withered condition maintain the true and unmistakable qualities of a genuine banknote. Even as a limp and filthy old thing it should still be able, in a precise and convincing way, to convey its message: "I am worth five Pounds", "I am worth one thousand Pesetas". These are tough orders.

So of course it is in the interest of any nation, both security-wise and as a point of hygiene, that the banknotes be treated nicely, that the circulation be of the highest possible standard of quality and that the condition of notes among its citizens be anyway as new and beautiful as possible, so that their characteristics are readily perceptible. But even as old and worn ones they should still be capable of inspiring the implicit and unaffected trust and common confidence, that it is all about.

This is the prime reason why it is so useful that the citizens occasionally familiarize themselves with the true nature of these virtues so that they have a clearer idea of the criterions of a banknote as it *ought to look*, and (if it should occur) of a "banknote" as it decidedly should *not* look.

"The inimitable banknote"

The wishful dream, the ultimate goal of The Society of Arts' desires in 1818 was "the inimitable banknote". And already at that time it was stated *that it does not exist*. This was concluded in their final report, and it is still an irrefutable fact.

The perfect, non-imitable banknote is beyond the conceivable. What man can do, man can do again. —But it can be made so damned tricky that for the private citizen it is really not feasible and so risky that even the most stubborn would prefer to *earn* his money in straighter ways.

As far as investment, energy, concentration, talent, patience and risk is concerned it is approximately equivalent to a task, once suggested by a Danish philosopher, of threading The Round Tower of Copenhagen and turn it into a nice big screw. He said:—Of course I can!

But it would be *very expensive!*

To the Illustrations no. 1-22

To photograph circulating banknotes is an undertaking that is, in most countries, met with by stern paragraphs of law or by more or less exacting rules, laid down by the issuing authorities. These restrictions, and their implementation may vary somewhat from country to country and so it is, even for the most respectable of purposes, not prudent to undertake such reproduction without making sure in advance that no rules are broken and no –be it involuntary– unlawful act committed.

Most of the illustrations on the following pages are historical banknotes that for decades have been obsolete and they have, like the Danish 100 kroner note (the only one among them that is still valid) all been reproduced in a way that would under no circumstance make allowance for misuse.

The aim of these illustrations is (mainly of course for the Danish public) to serve as an indication of where to look and what to look for. *But for the actual looking you will find it much more rewarding to take a real banknote from your pocketbook and locate the various types of item referred to in the text. A good magnifying glass will improve your possibilities of familiarizing yourself with this field of knowledge, and a really strong glass (6 or 8 times magnification) plus a little extra attention and alertness in your scrutiny will make you wiser still, especially if you place yourself in good light coming from a convenient angle (preferably from in front or –for right-handed persons– from the left, so that neither your hand nor the glass itself is shading or obscuring your field of vision upon the banknote! (If the light is strong and rather oblique it will improve your possibilities of appreciating the minute differences in ink layer thickness so frequently referred to.)*

Ill. no.

1 This is a somewhat crude, but very instructive illustration (from an official US public relation brochure) demonstrating the differences in line-quality and crossing-clarity upon a genuine banknote as opposed to a counterfeit one. It shows ostentatiously, but in a nutshell, what the previous text and the following illustrations are all about.

2-3 A double illustration, to-day mostly of historical interest. It is from the 1860's, when it had not yet become possible to make good photographic printing blocks, let alone modern printing plates, and consequently most forgeries were *engraved* ones. By comparison (even here in the modern screen reproduction) it is quite obvious that the counterfeit (no 3) must have been quite a job of illegal, professional home-work, committed by some corrupted engraver with evidently more than common vocational training. He has been fully aware of the fact that true imitation of portrait, background etching areas of ruling, lettering, white-line rosettes and "needlework" was virtually impossible without having access to specialists and machinery, so indeed he has deliberately "made it do" with what he considered "the effect of sufficient likeness". One can readily understand that in their days such prints have often been of a certain danger, and a challenge to public alertness, especially in a case like this, where the value involved is a so

comparatively modest one as a mere half dollar. (It is not unlikely that the forger has counted on the only so slight attention commonly paid by the man-in-the-street to such low denominations. If not, he might as well have spent his efforts on the hundred dollar bill). This one must have been a trivial nuisance whenever it occured. But too inferior to justify the trouble of tracing the perpetrator! To the single victim it was not worth while, but it must have caused a lot of vexation in its time.

At that period the American communities must have been pestered by a flood of forgeries. This one came in 1863, only two years before this public menace became so all-pervading that the US Secret Service was founded and charged with the express prime commission of curbing the increasing mass of spurious money. (The Secret Service only had it as a secondary commission to safeguard the President of the United States, i. e. to form his body-guard and take care of his personal security. This throws quite a revealing light upon the really serious extent to which the counterfeiting problem had grown.)

In their quaint little way these two ageing examples, of genuine and counterfeit origin respectively, still underline the importance of one fundamental and ever valid axiom of security graphics: "The making of an original printing plate for a banknote must not be possible for one single man. It must be a teamwork involving a plurality of specialists doing their very best, and also involving expert use of costly and difficultly accessible machinery."

4-5 This photographic close-up of a Danish 100 kroner note shows a selection of the various security-graphic items dealt with in the text. And below it, on the same page (illustration no. 5) is an enlarged, direct photograph of the original steel plate, showing how the same parts look in the engraving. Of course it is difficult here to demonstrate the varying depths, but looking a while upon this you will doubtlessly be able to form some impression of it, especially in the rather bold white-line section surrounding the large figure in the outer left hand fourth of the picture. In this white-line rosette pattern the small intermediate "troughs" often reach depths sufficiently large to transport on to the paper an ink layer so substantial that it can easily be felt directly with the fingers, but in most other parts the variations in depth are often down to a few hundreths of one millimeter.

4 We shall, however, remain for a while with the upper illustration (4), the 100 kroner note itself, in order, to name the various types of item:

A is a typical sample of *white line work* (in this case with a combined 100 figure in drawn and subsequently hand engraved work plus an addition of depth-gradated machine rulings embedded in it.)

B is a characteristic piece of *black line work*, furthermore it is of the so-called "flow-etched" type: If you look closely upon the real banknote taken from your wallet, aided by the magnifying glass, you will be able to follow how every single line has been etched deeper towards the centre part so that the ink becomes denser and bolder gradually inwards in the pattern, because the lines in the original steel have been made gradually deeper and wider. This makes the ink upon the note a tiny, but very decisive trifle more solid there than in the outer parts. And this is of enormous influence upon the way the public perceives it.

(Upon the opposite page (illustration no. 6) you will see one of the very few counterfeits this note has been subjected to over the years. It is quite evident that the criminal has blankly given up any attempt at-all, especially in this particular respect.)

C is the imprint formed by the *portrait engraver's free hand work* in the steel. His fine gradation of variegated dots and lines in the tones of the face, in the hair, the bolder lines cut to form the lapel and the waistcoat display differences in depths and variations of line that naturally are considerably larger than the ones just mentioned under B.

D is the *micro lettering* in the ground tint. This is an example of lightly etched, *pantographed diamond engraving.*

E and *F* are engraved samples of designed *lettering,* showing widely differentiated line treatment in *combined free hand and machine ruled engraving.* And in the value line (F) it is worth noticing the sharp and clear quality of line crossings in the double-hatched *medium shadow zone* along the lettering in the ruled bottom tint of the riband

(upon your own banknote!)—This is of course completely corrupted in the forgery. *G* is *further engraved lettering* (in the law reference, blending into the ground tint micro lettering). This has been engraved with the same type face as that of the micro lettering lines in the general all-over pattern, but with a slightly larger, bolder and deeper version of it. Note the clear difference this causes in spite of the fact that both degrees of lettering are printed with the same ink, from the same plate and in the same go! (Remember again you must of course not take your magnifying glass to the photograph here in the book. This is only—like all the other pictures here—a common screen print. So take your glass to the note itself!) The faint wave.line structure running obliquely all over the photograph is coming from one of the *offset printed ground tints* and these lines are consequently *not* in the engraving. (They are engraved separately upon glass plates). And the small "emblem" or seal partly appearing in the lower left hand corner belongs to the second one of the offset underprints.

5 This is the, substantially enlarged, photograph taken directly from the original steel plate for our 100 kroner note with Ørsted's portrait. It shows some engraved and some etched details, but largely it is only the white line parts that throw sufficient shadow here in the photograph to convey any impression of the recessed nature of the work. It is from the various mirror-turned recesses of a plate like this that the printer's ink is "taken up" when the note is being printed: First the plate is inked all over, then most of the ink is wiped and polished away again so that the plate surface is completely shining and clean again, and it is only the ink left down in the grooves below the surface that goes on to the paper and form the sharp representation of the engraver's work that you see upon your banknote.

6 This is a counterfeit of the note vis-à-vis. You will see that the two parts of the central rosette (white line and black line work respectively) are seriously displaced from one another, and this of course could never happen if they were printed from the original steel. The patterns of guilloched line work are poorly reproduced and lack definition, and the various subtle linear gradations of the lettering (especially in the shaded hatchings!) are grossly corrupted and coarsened. The pictorial representation in the portrait is even worse than the already very inferior American example shown in 1. The hair and the eyebrows of Ørsted are smudgy and unclear, and the original engraving's finely varied build-up of dot- and line-depths that form the facial skin tones in the genuine note have in the counterfeit become a rough and lumpy streaking that has very little in common with a fine original print of high class engraving.
The rather inferior quality of paper used by the forger has already (after a very brief circulation) caused that the print upon it has started to crack up along the upright fold in the middle.
(Upon the genuine note (ill. no. 4) right along the curved upper limit of the central rosette, a few millimetres above the figure 100 you will see a very slight irregularity, a smudge caused by a little amount of surplus ink, that minutely "tresspasses" into the narrow, pure white dividing zone between the two concentric components of guilloche. This is an accidental phenomenon you will often find upon genuine banknotes from all countries, and it is only due to minor mishaps in wiping the ink off the printing plate. It occurs where deep layers of ink have been accumulated to some little excess that is then dragged across the engraved line's edge or "shoulder" as it is called professionally. Strictly speaking it ought not to be there, but of course in reality it is only one more sign that the note really was printed from an engraving!)

7-11 This is an assembly of small fractions of various banknotes, showing details of extraordinary achievements of professional skill. The remarkable thing about them is that they have all (except example no. 12 in the lower right hand corner) been *enlarged no less* than 5 times! They all come from countries that have cultivated the realm of graphic security to a high degree of quality within the fields we have dealt with till now. But apart from this or rather on top of this they have paid special attention to developing the *microwork*, often with astonishing results. Prague, Vienna, Budapest, Moscow, Peking and Tokyo are noble old centres of security-graphic

tradition, and the fragments shown here are from (7-8) two elder Soviet rouble notes and from (9-10-11) two elder Czech korun notes (from the period it was called Bohemia-Moravia, or rather "Böhmen-Mähren").
They show examples of the *mezzotint work* that is briefly described in the text and that is typical of some of the eastern schools. Some of this is shown in interference—patterns (7) and some in varying depth effects of white line areas and of negative lettering areas (9). There are also some beautiful and quite intricately interwoven samples of *composite guilloche work* plus some rather exceptional feats of incredibly minute *pantograph engravings*. For instance the total height of precise and beautifully articulated roman type face lettering that is situated *inside the thin outer frame line* in (10) is quite a good deal less than half a millimetre! And the frame line itself, within which the lettering stands, is but 6 tenths of a millimetre in total width! The riband of lettering wound around the wreath of wheat or barley in (8) has been engraved with distinct and clearly legible scriptures in Cyrillian, Armenian and other foreign alphabets, all so remotely tiny that the head of a common match would cover an entire sentence completely!

12 And then, in the lower left hand corner, there is a fragment of an Hungarian note that has *not been enlarged* here. It goes to show white line work juxtaposed with some perfect, gradated and flow-etched, black line work. In the æsthetical sense its virtues can admittedly be contested at some length,—but as an outstanding accomplishment of graphic security craftsmanship it is virtually above reproach! (Of course, looking at the illustration here, you will have to take the author's word for this. But anyway the fact that this illustration is size 1:1 gives you an idea.) The original is printed in a blue of very vivid gradation.

13-14 This fragment of an old Danish 100 kroner note and the entire front of a 50 kroner note both belong to a series that went out of circulation by the end of World War II but will still be remembered by many Danes, also because some of the printing plates lingered on for some years, but in other colours. Professionally they were quite peculiar. For banknotes these obsolete, traditional line

etchings of folksy pictures, embedded in neat, but rather dull foliage in relief engraved structures were a bit floppy in design and æsthetically they had almost nothing in them of valuable security tradition. Still they were popular. They had a certain, slightly sentimental appeal in their choice of motives, and their somewhat provincial echo of Art Nouveau could not offend anybody. Theirs was a self-indulgent, self-sufficient and thoroughly petit-bourgeouis environment, a comparatively sheltered corner of the Europe that was generally frustrated within narrow "old world" patterns of the decade prior to World War I, and in such corners there was no great challenge. Art and "culture" were more or less official affairs, (and the things that later proved of real consequence happened far from "official" bounds). Approved art was an unobtrusive and neat thing to be framed and hung upon walls of unobtrusive and neat homes. A solid and venerable Academy-artist, who knew next to nothing about these fields, designed the banknotes, and everybody was happy, or didn't care. To-day they are but sentimental souvenirs that do not reflect or provoke anything except perhaps the usual vague, nostalgic reference to "Good old days" (that you would flee away from were you to start them all over again!) The climate of "official" art was reminiscent of the atmosphere around The Sleeping Beauty—with no prospect of the prince ever arriving.

The lettering is designed and engraved in a way that would inspire any modern vocational guidance to implore the perpetrator to seek another profession. It was a piece of luck that the actual transformation of these drawings was at least commissioned to people that were real professionals, so that, seen from a purely technical point of view, the final outcome was not only defensible, but actually in parts quite sensible as well.

In some of Europe's smaller countries, including Denmark, problems of security graphics have during several decades of the latter nineteenth and earlier twentieth century been peculiarly and inexplicably neglected, also as far as ordinary negotiable securities and official bonds etcetera are concerned. Some of these papers have had circulation-periods of considerable length, and quite a lot of the still remaining ones would to-day scarcely be found admissible for trade

on the larger international exchanges that usually have very strict rulings regarding formal (technical) requirements for negotiable printed securities.

15 Then let us turn away for a while from such drab mediocrities and enjoy this admirable bagatelle instead. It is only a very small fraction of an historical 20 dollar bill (from 1869) but very substantially enlarged here. The lettering is a thoroughly cultivated piece of draughtsmanship of simple and clear neoclassicist beauty. To-day still it is vastly superior to most engraved lettering of later origin. Furthermore a little fraction can be seen of two various types of etched ruling: (I) The finely structured one in the portrait background (juxtaposed with two extremes of the tonal range of free engraving, one the airily elegant burin work in the superbly modelled engraving of the necktie, and another the boldly engraved shades of black as seen in the equally superb rendering of cloth in the breast and lapel) and below the portrait an *assuré* ruling (II) intended as a ground structure for numbering. This has been given a deliberate degree of unique "grain" in the naked-eye effect by means of wider spacing and built-in irregularity of "intended tremble" in the rule along which the lines were engraved (The "Casilear-principle"—another little refinement from pioneer times, showing their typical knack of sophisticated and technically disciplined evolvements upon far older treatments in classic free engraving.)

But the prime reason for bringing this fragmentary illustration is to show a charming example of a type of work that used to be an important item among security features of their day, *the needle work*, i. e. the light-handed, at times almost superciliously sketchy use of the needle for light etched parts that served as transitory decorative or ornamental link-ups between the main components: the frame scrolls and floral fancies etcetera. Of course this capricious and unique (and at their time alledgedly non-repeatable) type of work has lost its importance with the invention and subsequent perfection of photography.—But needlework is still very much in use (for other and very good reasons) in various parts of modern banknotes. At times it forms large secondary areas, often of considerable detail, in pictorial and other parts. But nowadays it never plays conspicuous rôles in the composition.

16 The Swedes have noble traditions in security printing. The oldest veritable banknote in Europe was actually Swedish. It came as early as 1661, more than half a century before we got started in Denmark 1713. Throughout the ages a multitude of private local banks in Sweden (the so-called "Enskilda Banker") have emitted banknotes, among which many were very fine. And generally they enjoyed considerable public confidence. And it is quite understandable that these various banks did all they could to maintain this confidence and prove worthy of it, because as a matter of fact these issues of banknotes were (for the private banks) simply equivalent to very substantial cash loans, and their rate of interest was a nice and comfortable zero!

Of course the very first Swedish notes did not have much in common with advanced graphic security. This would also transpire from the fact that as late as 1760 they leaned more on stern warnings and unmistakeable threatenings than on graphic sophistication and other niceties. Their legend played harshly upon basic human emotion and motivation. It is a great pity that the "melody" of the old Swedish phrasing cannot be conveyed in translation, but even in spite of the quaint ring of a bygone age there is no room for misunderstandings:

"He who Apes this Note shall be Hanged, but he who Provably Detects the Ape shall Receive a Premium of Forty Thousand Thaler in Copper Coin." (It is expressly emphasized that the *premium* will be the real McCoy, good, sound, weighty copper coin, —not this here flimsy scrap of paper money!)

During the governorship of one of the outstanding men in Swedish banking, professor J. Bagge, there came (in 1892) a very elegant series of beautifully engraved banknotes that are still vividly remembered by a large proportion of the Swedish public because for generations they constituted a sort of classical prototype of Swedish banknote right up to near our times.

The reproduction here, especially the allegorical picture of "Mother Svea" has deteriorated (duly!) on account of the underlying protective print!

17 This dreamy lady, putting on the languid look that suggests occupation with lofty things (in surroundings where cloud tops are perfectly understandable for settees) would of course be perfectly, ludicrous were anybody seriously to contemplate putting her upon a present-day banknote. She was, however, engraved barely ninety or eighty years ago. And whoever she is and whatever her peculiar doings are intended to convey: She is a piece of deft draughtsmanship that Tiepolo himself would not have been ashamed of, and the representation in original plate printed engraving is a complete masterpiece of security work. The way it plays upon the variegated graphic expressions of material structure and tonality in alternating boldness and subtlety, solely in eloquently formed engraving "manners" and gradated depths of ink is a virtuoso-performance.

18 In spite of its awesome age and its frail (almost cigarette paper thin) material, its worn-down print and its venerable condition of having seen much service, now about one and a half century ago, this noble old five dollar bill of Lewistown, Pennsylvania is still aloft with graphic refinement and admirably simple, straightforward æsthetic culture. The finely treated portrait medallions that have been made by means of the relief engraving machine, and the application in handwriting of the year tell us that it was made in the far off years of the previously mentioned Asa Spencer. His name even appears upon it (below the top border) but barely visible here in the reproduction.

19 The "Gothic Revival"-expansions of Victorian days gave rise to many frank and outspoken, and at times rather confused, hybrids of style with peculiar remnants of sundry well-worn leftovers from various ages, combined and juxtaposed with a crafty zest and a carefree gusto that occasionally produced astounding results. Nowadays such, more or less studied, recklessness seems to be "in" again.—But no matter whether this could be called "style" or not: This composite array of lettering from a Bolivian banknote, engraved in London, *is* rather a brilliant example of machine engraved and flow-etched structures of high quality, and they are cunningly calculated to display these characteristics so that they are fused into one precise and habitually familiar picture or "fixed retinal image" with the public in the many hasty glances thrown upon them during the multiple situations of daily handling of banknotes.

The picture engraving to the right hand side shows a little Latin American street scene and it is a charming little proof of the engraver's ability to choose his line "manners" in refined and eloquent ways in order to suggest both daylight and material structure with a striking graphic efficiency: The slightly clouded sunlight at high noon just grazing obliquely along the ageing palatial wall surface, and the treatment of light and material in the animals and humans in the little plaza, the elegantly touched but very well defined details of architecture in the exquisite Spanish baroque of the distant church tower in the hazy sunshine. All of it done with such stuck-up and intelligent sovereignty and apparently casual ease that it brings some of the great classics of the art of copperplate engraving to mind: a Bellotto, a Piranesi and the inferior details of little street figures and other secondary parts of their, at times weirdly grandiose, prospects or vistas of the 1700's.—But *of course* things like these must be seen in the original print, upon the banknote itself. That is finally what it is all about. Illustrations like the ones printed here, showing banknote work in common screen reproduction can naturally only serve as hints or pointers, never as direct examples.

In our specific context here it is of course lamentable that the various prohibitive rules about photographic reproduction of banknotes are barring our possibilities of illustrations, and naturally this has, to some extent, affected our choice of samples, thus giving the selection a perhaps somewhat lopsided, historical or oldish flavour that may incidentally look a little on the reactionary side. But this should not deceive the reader. It does not mean that all good notes are old notes. There have been quite a lot of nice, and even some excellent, banknotes made also in our decades of the mid-twentieth century. There have also been mediocrities. Galore. And a few abominations. Also there are countries that have seen *a virtue* in abandoning well-founded tradition, and so they have embarked upon ambitious schemes of superficial artistry, almost militantly effec-

tive and "modern", sometimes in the devious sense of being "new and astonishing". There is a snag here, because it can admittedly be refreshing that something is *new*, but it can never be sufficient that it is *only* new. These fields have now and then been subjected to feats of modern design that, security-wise, are so problematic as to entail imminent danger of attracting attention of the more-than-average intelligent part of the minor, but ever-present number of citizens of criminal disposition. And in this context therefore such banknotes ought of course to be politely passed by in silence.

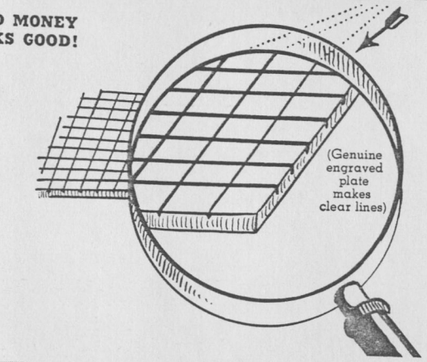
20 So it remains tricky and it requires careful thought before embarking upon "manifestations" of modern art, be it figurative or non-figurative. It must be remembered, that banknotes are not made to please the eyes and saturate the minds of an advanced and select community of art connoisseurs. It is irresponsible to assume that the entire population is critically and æsthetically conscious and actively interested in Art.—Admittedly, if this were the case, an original aquatint etching by Picasso would be an incomparable document of security. It is a unique print-original, non-repeatable, even by the artist himself. So it cannot be forged. But alas; knowing full well what abominable sorts of commercial reproductions, made from even the most superb works of modern art, you can encounter, seriously framed and hung upon walls in the homes of a hilarious, docile, submissive *or* enthusiastic, "art-interested" public, the use of such works for security purposes must be regarded as merely Utopian.

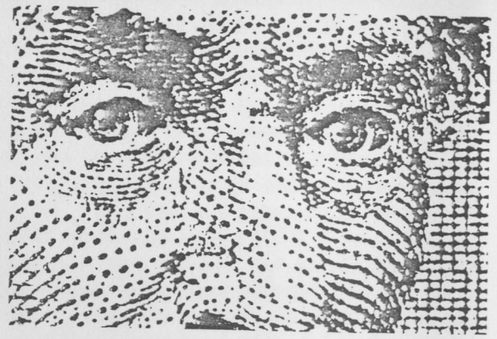
For such reasons it has, already from an early stage, become essential to express graphic subtlety in a plain and straightforward guise. Simple topics.—And readily comprehensible ones. Upon this old Bolivian banknote the elegantly flow-etched, machine-ruled tint has been used, partly to form the tints of lettering and partly to depict the billowing coal smoke from the stack of a wonderful old railway engine! Of course the photographic screen reproduction here can only convey a faint reflection of the effect in the original print.

21 This fraction of an old Bolivian note, also engraved in England is but a sentimental trifle, an idyllic little pastoral scene. And that could well be all to be said about this neat picture. It would be easy to dismiss it at that and then brush it aside. Its Greuze-like and somewhat sugary sweetness could easily amount to a direct insult if it should be intended to represent rural bliss and happy peasant life of the lower classes in the countryside in those days. Reality is likely to have been a good deal different. But in spite of this embarrassing sentimentality it is at the same time a sublime work of art and an exquisite piece of craftsmanship. Even here in the reproduction it reveals, with a most convincing authority, a masterly choice of line-"manners", both in plants, animals and figure. The characterization of detail, the material suggestiveness and the tasteful rendering of "gallery-lighting" in the landscape is, all of it, done in a clever vein of the eternal, dreamy late summer afternoon in Arcadia as once immortalized by a Claude or a Poussin. The decorative ornamentation around the picture belongs to a bygone age, but it has simple clarity and eloquence of style. And technically this picture would, upon a banknote, even to-day, give full justice and complete service as a piece of brilliantly well-formulated security engraving.

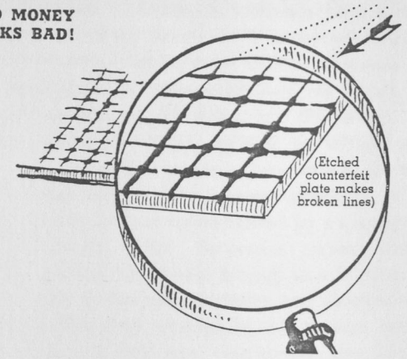
22 And finally, about two times enlarged, here is a corner of composite white line work and acanthus engraving, frank, cheerful and superior in the way it is combined: The machined work has the same kind of uninhibited elegance as the free hand engraved floral parts so generously incorporated in it. Lavish and charmingly cocksure burin-strokes of a striking calligraphic effect. The accentuations are coming and going (as in beautiful penmanship) while the lines describe the light as it comes and goes upon the shapes of the little round berries and the beautiful foliage. The varying layer thickness of plate print ink lends to the original note an effect that is simply formidable.
Quite apart from the incidental style or predominant taste of some period or other, and also apart from the fact that this engraving happens to be a likeness (i. e. it happens to represent some botanical object) it is essentially a thing of graphic momentum and so, in the very best sense of that label, it is an authoritative and spirited work of ever modern art. (The perpetually searching and all-period—appreciating Picasso would have loved it!)
—And whilst we are at it: This little by-theme, the acanthus engraving, is one of the fields where you can indulge in your own reflections whenever you may have the opportunity. It cannot be illustrated here because the two examples used are, both of them, circulating banknotes. But for instance a US 20 dollar bill and an Italian 10,000 Lire note will offer you a nice comparison between two, equally superb, but fundamentally different conceptions, artistically, of the rôle played by this kind of free hand engraving: In one the foliage-ornament is formed by means of bold, open and broadly visible strokes, showing the "calligraphy" of the burin, and this is a typical American way of graphic expression in this type of work. The other one is through and through Italian (upon the "Michelangelo-note" that is so familiar to many travellers) and is equally typical. But graphically the latter expresses itself with a tiny, pointed and meticulous finesse in its engraved interpretation of one of the most exquisite and delicate marble sculpture representations of acanthus foliage or herbal themes ever made during the age of Roman antiquity (from the Ara-Pacis altar in Rome).
So one of them is a doughty display of the bold character of engraving, readily perceptible at normal reading distance. And the other one of them is just as conscious, but sensitive and almost needle fine in its pursuit of an analogous theme. So delicate and discreet that at normal reading distance it is almost effacing its own excellence!

GOOD MONEY
LOOKS GOOD!





BAD MONEY
LOOKS BAD!



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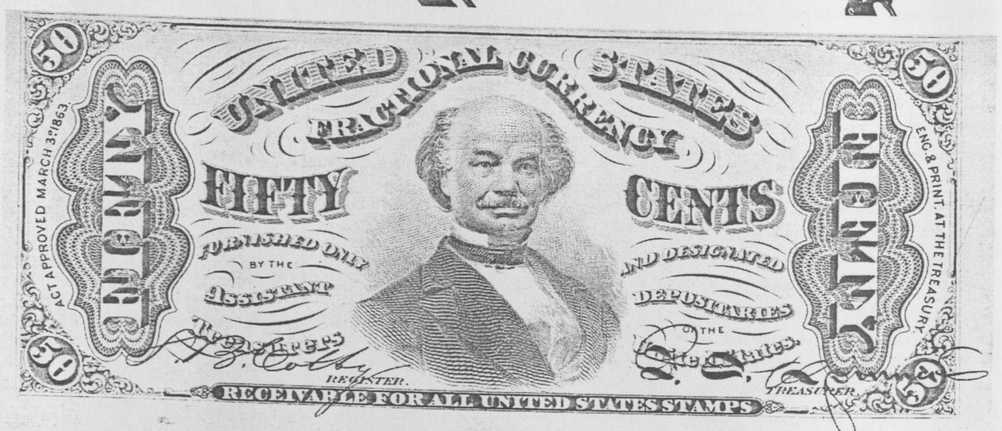

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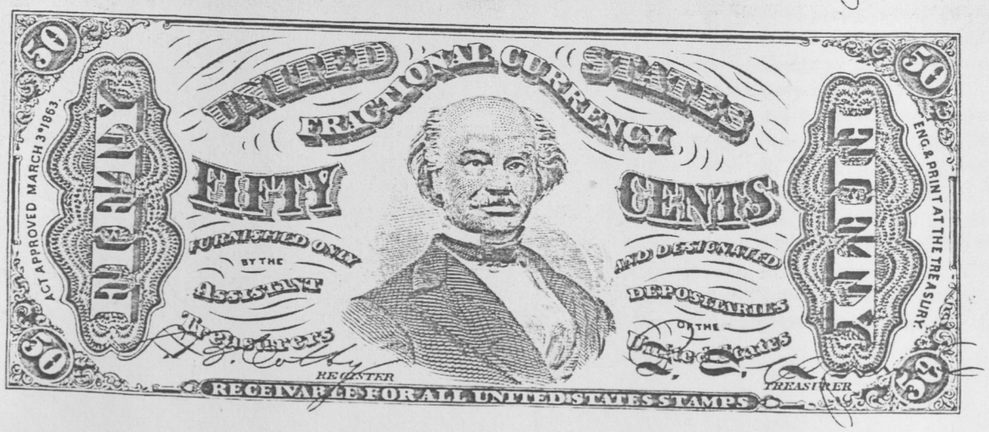

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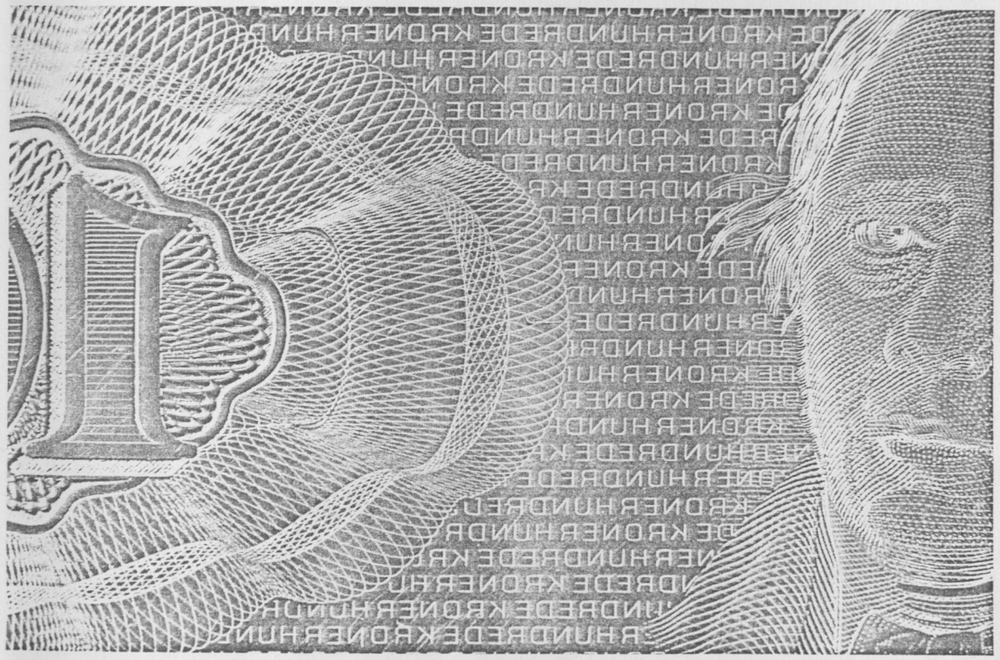
C→ ←E ←B ←A ←B ←D ←F ←G

4



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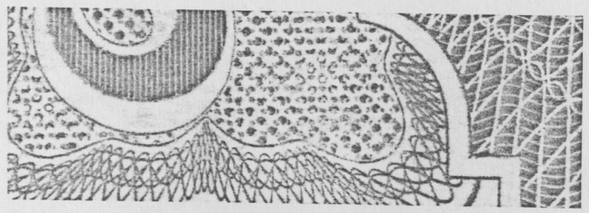

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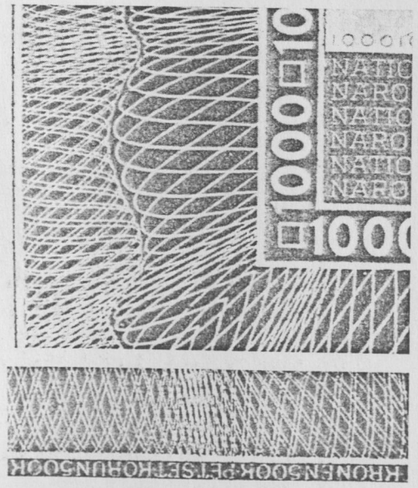

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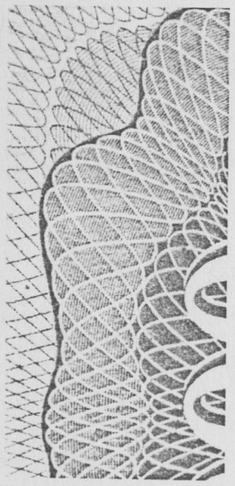

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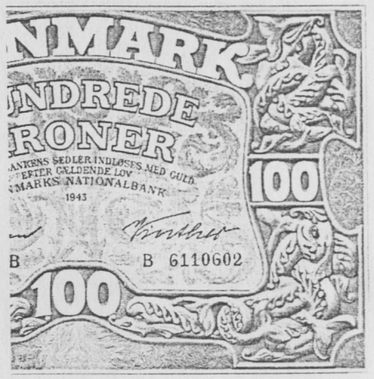

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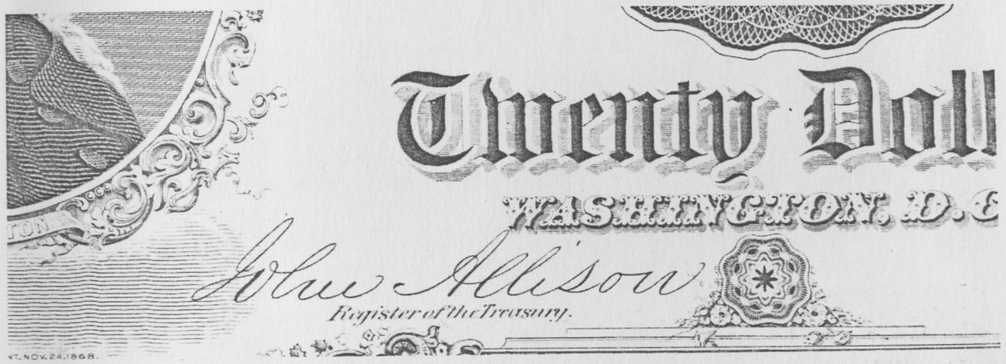

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The new Danish Banknotes

"Serie 1972"

Upon the new Danish series of banknotes you will recognize a good deal of the various security items that have been described in the previous text. There is no need to line them up or name them. Surely you will be able to do this yourself, without any blackboard pointer guidance. So you are invited once again to take up your magnifying glass and find the various components upon the notes, one by one, completely on your own.

But it may be an idea though to tell you a little about the pictures *that have been used. A lot of them will already be well-known to many art-interested Danes, because they happen to be choice samples of Danish portrait painting, all of them done by Jens Juel (1745-1802).*

Front pictures

ill. no.

23 10 kroner. Mrs. Cathrine Sophie Kirchhoff, b. Christensen, painted 1768.
The original belongs to the State Museum of Art, Copenhagen.

24-25 50 kroner. Mrs. Ryberg, b. Falbe, detail of the large Ryberg family picture, painted 1796/97.
The original belongs to the State Museum of Art, Copenhagen.

26 100 kroner. Jens Juel, self portrait, painted in Dresden 1773/74.
The original belongs to the State Museum of Art, Copenhagen.

27 500 kroner. Unknown lady, probably Mrs. von Qualen. Year unknown.
The original belongs to the Museum of Ahrensburg, Holstein.

28 1000 kroner. Mrs. Thomasine Heiberg, b. Buntzen (later Mrs. Th. Gyllembourg), painted in the 1790's.
The original belongs to the Museum of National History, Frederiksborg.

of Jens Juel's portrait paintings

The more or less significant individual fame of the various portrait models has not been taken into consideration. In fact the only really famous personality among them is Jens Juel himself, upon the 100 kroner note. The majority of them would have been utterly forgotten were it not for the fact that Juel painted them. This is not entirely true though for the charming maiden portrait that served as original for the 1000 kr. portrait engraving. The simple legend upon the guilt frame: Mrs. Thomasine Heiberg, née Buntzen happens to be identical with the later Danish lady-novelist celebrity (yet unknown outside her own country) *Mrs. Thomasine Gyllembourg.* But this is purely incidental, the true reason for her presence in this selection is the picture itself. And the prime motivation, artistically, for choosing Jens Juels paintings throughout this entire series (apart of course from the fact that he was one of the most superb and charming portrait artists Denmark has ever had) is that most academic portraiture of that period frequently had a sort of built-in regard for its possibilities as engravings. More or less consciously the pictures were painted with a view to this. Whether they became popular or even famous pictures or whether they simply happened to represent famous or revered personalities, they were very often published as copper plate engravings that were printed and sold, at times in considerable numbers.

Clemens, our greatest copperplate engraver, was a close personal friend of Juel's and has in a multitude of engravings interpreted his art with excellent skill and a striking capacity of artistic identification (Juel's

interestingly free and uninhibited private portrait of his friend Clemens was actually for a while among the pictures being considered for this series).—And the fact that an engraving is so to speak "inherent", as a latent germ, *in* the painting has been the decisive and leading line of thought when the final choice of subjects were made.

That solely pictures by Jens Juel were selected all the way through has, in all probability, supported the homogeneity of this "banknote-family". With another fine portrait painter, C. A. Jensen for instance, you might run into complications, because the artist's personal style of brushwork itself plays such a predominant rôle in the result. Many of Jensen's best pictures would be rather problematic were they to be "translated" into the form of engravings. This would, at best, mean that it might prove difficult to make them "fall in line" with engravings after Juel.—And from an artistic viewpoint this would scarcely be justifiable with so excellent a painter as C. A. Jensen.

The watermarks

ill. no.

29 The theme of the watermarks for 10-50-100-500 kroner is Juel's already mentioned self portrait that he painted in Dresden in his early manhood. This has been composed repeatedly as a vertical frieze together with the respective value figures for each denomination. The watermark of the 1000 kroner note is different. It has a frieze designed from a double portrait that shows him later in life together with his young and beautiful wife. It is painted in Copenhagen 1791 when Juel was a well established professor of the Royal Academy. (Both pictures are still in the Danish State Museum of Art. The original for the latter is slightly damaged by surface crackle.)

Back pictures

The backs of this banknote series have pictures that are printed in offset and engraving after:

10 kr. Watercolour by Johannes Larsen: Eider duck, (somateria mollissima L.) female, splendour season feathering, 1909.

50 kr. Drawing by Ib Andersen: Carucian carp. (carassius car. form. typ. L.).

100 kr. Watercolour by Ib Andersen: Butterfly ("Red ribbon of order", nupta L.)

500 kr. Drawing by Ib Andersen: Green lizard (lacerta agilis L.)

1000 kr. Lead pencil and wash by Ib Andersen: Common red squirrel. (sciurus vulgaris L.)

The 10 kroner back vignette is a lithographic reproduction from an engraving after a watercolour picture of an eider duck by the great Danish painter *Johannes Larsen,* who was a very prolific draughtsman (and at the same time a highly respected ornithologist) J. L.'s works often unite scientific reliance with artistic precision and simple natural charm. Occasionally also with a certain discreet and noble humour, but never along the well-trodden paths of Aesop, Lafontaine or Hans Christian Andersen (—not to speak of Walt Disney!) There is never a hint of antropomorphic interpretation. His is a peculiar gift of making the animal "personalities" really remain animals, like for instance this sympathetically understood little eider person from among the tufts of low coastline meadows.

co-operation with Ib Andersen

The four different animal vignettes upon the other backs of this series have all be drawn by Ib Andersen. They have been worked out specifically for the banknotes and in close co-operation with Danmarks Nationalbank. And a good deal of the viewpoints concerning the security-graphic use of the various effects of free engraving have been applied during their preparation.

His drawing of a squirrel, in lead pencil and wash, for the 1000 kroner note must be very nearly the last one he made before his death. The butterfly, the carp and the lizard as they now stand upon the notes are engraved after animal studies of great devotion and care. In this field Ib Andersen was indisputably the sovereign heir of Johannes Larsen. And his ideals, artistically, were as straightforward and pretentious (and, in general human terms, as simple and unpretentious) as ideals could well be: Pisanello, Bewick, Crivelli and his beloved Johan Thomas Lundbye (of Danish fame).—Just look upon the notes to see whether you find he falls much short of such ideals!

Alone his studies of the growth-principles in the scale pattern of a carucian carp, and later the analogous problems with the lizard, form a couple of voluminous bundles worked out before the final originals. Many of these preparatory drawings, also for the butterfly, were made by means of a stereo-microscope and at one time life in his wonderfully furnished North Zealand study was a good deal more diversified

than most housewives would have stood without comments! His big, elderly tomcat (usually surrounded by a certain atmosphere of respect) a prize specimen of some robust rural, black-and-grey striped tiger animal race, picking his silent, sinister paths out there in his jungle among the bushes, was refused his, usually unquestioned, access to the study. His majesty was taciturn and grimly affronted during the entire period. But *inside* the study the vivid and unrestricted squirrel was *really* at large and saw to it that nobody got bored!

—Did you ever see how a bright and carefree squirrel at the top of her form behaves in a large and protected, high and well-heated room, with no admonitions and no lurking dangers whatever? "She prefers to sprinkle her pees from lofty places", was Ib's loving comment when once asked how daily life progressed in the company of his graceful and roguish, but temperamental model for the 1000 kroner note. Yet occasionally there were sounds of remonstration and open protest when they were literally fighting over the very sheet of paper upon which she was to be drawn. From various corners of the room came the cosy tinkle and faint trill of his crickets, among which a handpicked one now and then had to do the ultimate service in order to keep the lizards alive and humoured for their modelling task for the 500 kroner note.

When the lizards had shed their skins we could pick up the cast-off ones and put them between glass slides for the microscope, or we could use them directly, as photographic diapositives when the various localized patterns of scale growth had to be verified in order to ascertain irreproachable correctness of design.

The large aquarium was being constantly kept in a sort of ideal biological brook- or forest lake-equilibrium for the sake of the carucian carps. And it was placed so that the daylight flooded beautifully down upon the glittering scale-sides when the fish swam along the glass walls. But for the detail studies the models had to be bought at the fishmonger's! Plaster casts were made, and also galvanos, directly from the scale structure.—And little by little, from all the pieced-together details, emerged the select, truly cultivated ideal of the carucian carp. Some rays of fins were adjusted here, some outline was corrected there, and finally there she was: The flawless Miss Carp. The Venus from Milo of carps.

—All in all the butterfly for the 100 kroner note was the most docile of the models, the one that gave least complications. It came from the Zoological Museum, and they had given it a discreet whiff of cyanide once for all. Thereafter it was held in position under the stereo-microscope by means of a pin and a cork. The ideal model.

co-operation with the academy of art

Apart from the just described co-operation with Ib Andersen the new series of banknotes has been created in close contact with the Royal Academy of Fine Arts, initially (and most competently) represented by Professor Gunnar Biilmann Petersen, whose resource of knowledge and indefatigable perseverance was legendary, and since his death by his successor, Professor Naur Klint whose term, however, started at a very late stage of the entire process. They have, both of them, with great devotion studied these fields of applied graphic art, and this special interest has given them extensive and well-orientated knowledge of these, otherwise so remote disciplines of artistic work. They have consistently aided the Bank in many of the artistic and æsthetic aspects. And this is, in so small a country, mostly sheer luck. Many other countries of similar description would perhaps find it difficult to mobilize such initiated and specialized capacity in the available consultant aid from their higher cultural institutions.

Why new notes?

specimen notes

From time to time new series or new single emissions of banknotes are sent into circulation by the central banks in all countries. Usually on such occasions specimen notes are forwarded, as a means of introduction and information, to the central banks of other countries, to foreign authorities, to banknote printing works, to larger private banks etcetera.

Such specimen notes are not proof prints in the common (experimental) sense of the word. They are purely circulation-representations, i. e. completely normal sample prints of the new emission in question, only differing from the valid notes in being clearly marked, either by means of a needled punching stamp right across or by some predominant overprint, clearly annulling them as means of payment. Usually they are also earmarked by a special numbering (as for instance "000000"). The cancellation is mostly the word "Specimen", at times also stamped in the country's own language, "Campione", "Muster", "Muestra sin valor", "Annullée", "Ugyldig", "Prøvetryk uden værdi" or a large Japanese, Arabian, Chinese lettering to the same effect.

In many central banks this common use of sending out such sample notes has, over the years, accumulated large and rather complete collections of the various emissions of other countries. And if one looks through this instructive and useful material it is very striking how different the attitude to the question of new emissions has been in the various countries throughout the ages: Some countries have huge volumes, swelling with an incessant flow of new emissions, and others have over long periods of their history had only a quite limited number of banknote emissions that have in turn lingered on and lasted unaltered for decades before being replaced by new ones.

good reasons, and less good ones

Of course there are many possible explanations to this. While countries like Sweden or Switzerland since the turn of the century have made only very few emissions it is readily understandable that for instance the German file of specimens (especially due to the spate of inflation-emissions after World War I) is a most substantial volume, swelling with a colossal variety of new notes. Wars, inflations, political upheavals, change of governmental systems, new ways of dividing-up state territories etcetera will often provide compulsive reasons for new types of banknotes to be issued.

Also the security against forgeries is by no means an eternally fixed concept. Technical progress within the graphic trades offers new and improved ways of reproduction for the forger, and for the legal issuing authority as well.—And in *that* race the legal must be absolutely sure to win! It had better win by a long and generous lead, so abundant that it even has leisure to put up hurdles and obstacles for its potential competitors all the time. (This is not mere gentlemanly competition!) And this means that graphic security people, in spite of their many links with a noble past with venerable and valuable traditions, must at the same time take a prominent position in the lead of a technical and scientific evolution that may in itself, occasionally, motivate new banknote emissions.

Furthermore such new emissions may also at times be merely capricious, or they may be due to pseudo-events: an anniversary of a reign, a governmental festivity of sorts, or that some coup-general or dictator suddenly cannot resist an urge to see his own picture upon his country's banknotes and so on . . .

Finally the reason may be mere fancy, merely some imagined compulsion towards new concepts of what is smart and *en vogue* for the time being. There are such things as modernity for the sake of modernity. Common inclination to see a change. But this is the feeblest motivation of all. A poor reason indeed if not combined with clear and significant progress in production efficiency and augmentation of the security lead.

and compulsive reasons

In Denmark we experienced a new banknote emission of a sensational and dramatic nature when all banknotes of the entire country had to be replaced totally and at short notice in 1945 right after the German occupation. The preparations for this of course were top secrets, and naturally the preparatory production had to take place clandestinely (since 1942-43). This made the problem of quality an utterly precarious one. Under conditions of war and provision shortage it had to be seen to that the new notes were sufficiently different from the old ones, that there would be a sufficient number of them, and that they were sufficiently secured against counterfeits. But there was no time for refinements and other niceties—and of course it was a self-forbidden notion to involve or initiate anybody outside a quite narrowed-down number of technical and administrative personnel in the preparations.—And certainly the results were in style with this! They were abominable. The public rose in outcry like the Old Testament one in the city of Rama. But the notes fulfilled their mission: the swift, secure and total replacement of all paper currency in the country. And *that* was what it was all about.

The forced background for their issue naturally entailed that still another, new and carefully prepared, emission was desirable within a comparatively short span of years, and so, starting with the beginning of the fifties came, successively, the note series that is still circulating and that has since, without complications and without noteworthy instances of forgery, served the daily circulation in our country for approximately two decades.

This series will now be replaced by a new one, whose motivations are the further improved conditions of production and security that have become available with the new building of the Bank, the new technical installations and the entire re-structuring of note production thus made possible.

Electronics and banknotes

It is predictable that new emissions from various countries will, during the coming decades, be increasingly influenced by the rapid progress of evolution within electronics as applied to everyday life.

Apart from the fact that electronic automatization already plays an important rôle in the production of banknotes it is also bound to exert a steadily growing influence upon their design, and upon their daily use.

It is, already now, a matter of course that banknotes should be adapted for problem-free use in sales automats, as easily as coins in a slot-machine (and of course such sales automats should be capable of discriminating reliably between genuine and counterfeit!) Banking institutions and large firms will within the near future, do all their counting and controlling of banknotes by means of electronics, possibly even so that the banknotes themselves will trigger the impulses that automatically keep account of in-going and out-going amounts!

It remains to be seen to what extent automats and counting machines are going to be adapted to the banknotes and to what extent the banknotes will have to be adapted to electronics. The numerous aspects of this will provide ample material for present and future discussion among electronics people and technicians on one side, and artists, perception psychologists and graphic reproduction people on the other side. The initial stages of this development are already at hand, and in some countries these considerations can already be traced upon their newest emissions. But evidently this has yet a long way to go, before the answers are found by everybody involved.

the banknotes of tomorrow

The banknote of the future will have built-in signals and other provisions for electronic use. And in all probability this will either completely annihilate or thoroughly liberate our technical and artistic concepts and approaches within this venerable craft. Admittedly (perhaps for ever?) it may remain necessary for people to recognize banknotes as genuine solely by their own senses, mainly their eyes.

And yet at some point (maybe not be all that far ahead?) upon the future line of development lies the ultimate goal that electronics people and national economists have already labelled "The moneyless society".

To most of us this is still a somewhat nebulous concept. It is a Jules Verne- or rather a Ray Bradbury-like science fiction image that we find difficult to visualize as a potential reality. But it is beyond doubt that time is rapidly moving in that direction.

Still, the banknote will remain with us as the common means of payment for quite a number of years to come. But it is quite certain that the look of it, and its part in our daily life, will be altogether different.

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On Reproduction of Banknotes

Imitation or counterfeiting of money with the intent of bringing it into circulation as genuine is a serious offence. Danish law provides a penalty range up to 12 years imprisonment, and the same punishment is due to anybody who with the same intent *provides either himself or somebody else* with imitated or counterfeit money.

This penalty range also applies to persons knowingly and wilfully *distributing* such imitated or counterfeit money. If the person who passes such money has *received* it *bona fide* the penalty may be reduced to shorter periods of detention or fine, but if he has had reasonable grounds to believe that the money he passes on for payment is imitated or counterfeit the penalty will be detention or imprisonment up to 3 years. These legal measures are further dealt with in the paragraphs 166-168 of the Danish Penal Code (Borgerlig Straffelov af 15. April 1930).

Paragraph 169 of the same Code also provides penalty for he who *manufactures, imports or distributes any object having essential likeness to money*. This (closer or less close) likeness to money is subject to arbitrary evaluation in each given case. Over the years a number of such cases have been taken to court and sentence has been passed on the strength of this paragraph.

Furthermore banknotes are covered by the Danish law of Rights of Origin for Literary and Artistic Works (31 May 1961) Paragraph 2 of this law gives (with few and strictly defined limitations) to the owner of the rights of origin (*in casu* Danmarks Nationalbank) exclusive copyright to the work of art in question and vests with the owner the right of reproducing it and making it publicly available, be it in original or in modified form.

10 KRONER

Series 1972

Note issued
8th April 1975 by the
Danmarks Nationalbank

Size: 67 x 125 mm

Paper: Cream coloured.

Watermark: In the left hand side of the note is a watermark zone with a self-portrait of the painter Jens Juel and the numeral "10" vertically repeated.

Security thread: In the right hand side of the note a security thread is embedded into the paper. Its colour may be light or dark, but the thread will allways be visible when the note is held against the light.

Face:

a. Ground:

Yellow ochre, made by a design of ochre, green and red lines. Under the numeral "10" runs a vertical "harlequin pattern" ribbon. In the watermark zone "Danmarks Nationalbank" is printed in ochre.

b. Printing:

Black (series in blue and number in red).
In the middle of the note slightly to the left is a guilloched rosette with the numeral "10". On the right hand side is a portrait of Mrs. Cathrine Sophie Kirchhoff, née Christensen, after a painting by Jens Juel (1745-1802).

In the white horizontal band below the rosette and portrait is a line of engraved script, "Ti Kroner".

Back:

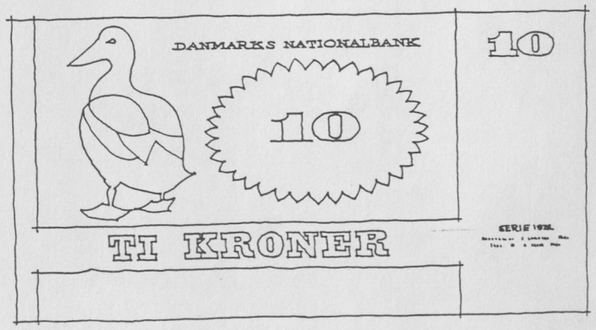
a. Ground:

Brown ochre, made by a design of ochre and grey lines.

b. Printing:

Ochre, grey blue and dark grey. In the middle of the note, slightly to the right, is a "harlequin pattern" rosette with the numeral "10" and on the left hand side a vignette of an eider after a water colour by the painter Johannes Larsen (1867-1961).

In the watermark zone the numeral "10" is printed in grey blue. In the white horizontal band below the rosette and vignette is a line of lettering, "Ti Kroner", displaying a multicoloured effect of horizontal line hatching.



50 KRONER

Series 1972

Note issued
21st January 1975 by the
Danmarks Nationalbank

Size: 72 x 139 mm.

Paper: White.

Watermark: In the left hand side of the note is a watermark zone with a self-portrait of the painter Jens Juel and the numeral "50" vertically repeated.

Security thread: In the right hand side of the note is a security thread embedded into the paper. The thread is always visible when the note is held against the light.

Face:

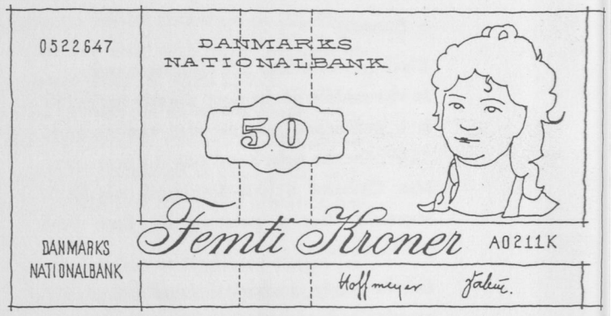
a. Ground:

Light blue.
Under the numeral "50" is a vertical "harlequin pattern" ribbon. In the watermark zone "Danmarks Nationalbank" is printed in blue.

b. Printing:

Dark blue (series in blue and number in red).
In the middle of the note slightly to the left is a guilloched rosette with the numeral "50". On the right hand side of the note is a portrait of Mrs. Ryberg, née Falbe, after a painting by Jens Juel (1745-1802).

In the white horizontal band below the rosette and portrait runs a line of engraved script, "Femti Kroner".



Back:

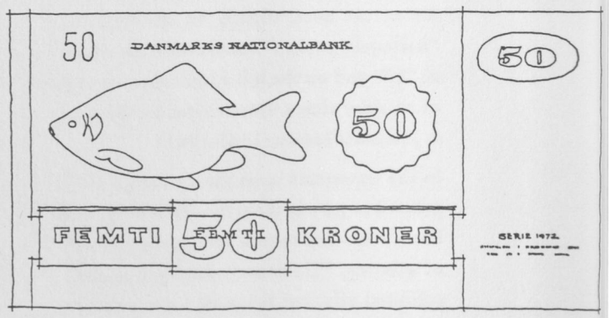
a. Ground:

Light blue.
In the left hand side of the note the numeral "50" is printed in ochre. In the watermark zone is a "harlequin pattern" rosette with the numeral "50".

b. Printing:

Dark blue.
On the right hand side of the note is a guilloched rosette with the numeral "50". On the left hand side of the note is a vignette of a crucian carp after a drawing by the artist Ib Andersen (1907-1969).

In the horizontal band below the rosette and vignette is a panel of lettering, "Femti Kroner" and "50 Femti", displaying various structures of machine engraving.



100 KRONER

Series 1972

Note issued
22nd October 1974 by the
Danmarks Nationalbank

Size: 78 x 150 mm

Paper: Cream colour.

Watermark: In the left hand side of the note is a watermark zone with a self-portrait of the painter Jens Juel and the numeral "100" vertically repeated.

Security thread: In the right hand side of the note a security thread is embedded into the paper. Its colour may be light or dark, but the thread will always be visible when the note is held against the light.*)

Face:

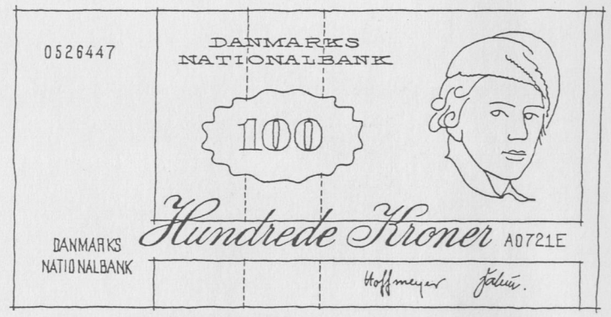
a. Ground:

Red, made by a design of orange, light blue and red lines. Under the numeral "100" is a vertical "harlequin pattern" ribbon. In the watermark zone "Danmarks Nationalbank" is printed in orange.

b. Printing:

Black (series in blue and number in red).
In the middle of the note slightly to the left is a guilloched rosette with the numeral "100". On the right hand side of the note is a self-portrait of the painter Jens Juel (1745-1802).

In the white horizontal band below the rosette and portrait is a line of engraved script "Hundrede Kroner".



Back:

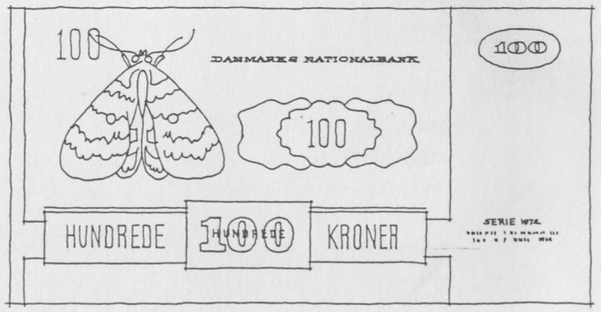
a. Ground:

Red, made by a design of orange, light blue and red lines. In the left hand side of the note the numeral "100" is printed in orange. In the watermark zone is a "harlequin pattern" rosette with the numeral "100".

b. Printing:

Black.
In the middle of the note, slightly to the right, is a guilloched rosette with the numeral "100" and on the left hand side a vignette of a butterfly after a drawing by the artist Ib Andersen (1907-1969).

In the horizontal band below the rosette and vignette is a panel of lettering, "Hundrede Kroner" and "100 Hundrede", displaying various structures of machine engraving.



*) Also in the *500 Kroner note* of this series dark *or* light security thread have been and will be used.

500 KRONER

Series 1972

Note issued
18th April 1974 by the
Danmarks Nationalbank

Size: 85 x 164 mm

Paper: White.

Watermark: In the left hand side of the note is a watermark zone with a self portrait of the painter Jens Juel and the numeral "500" vertically repeated.

Security thread: In the right hand side of the note is a security thread.

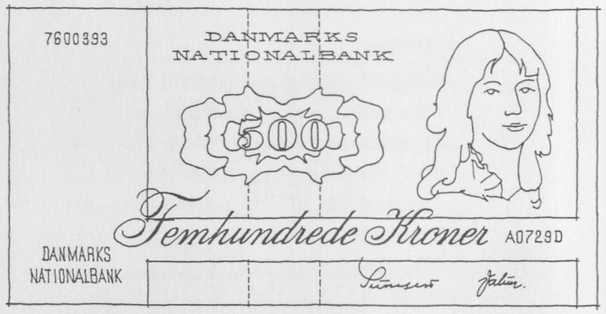
Face: *a. Ground:*

Green, made by a design of green, blue and ochre lines. Under the numeral "500" runs a vertical "harlequin pattern" ribbon. In the watermark zone "Danmarks Nationalbank" is printed in green.

b. Printing:

Black (series in blue and number in red).
In the middle of the note slightly to the left is a guilloched rosette with the numeral "500". On the right hand side of the note is a portrait of "Unknown lady", probably Mrs. von Qualen, after a painting by Jens Juel (1745-1802).

In the white horizontal band below the rosette and portrait is a line of engraved script, "Femhundrede Kroner".



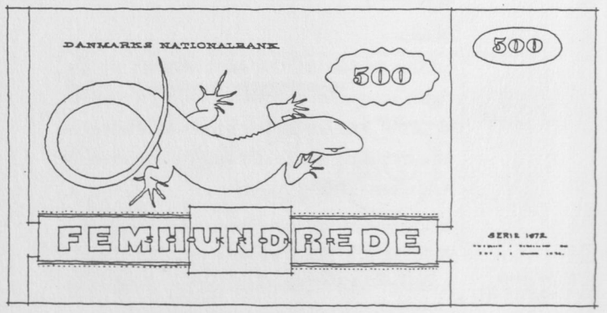
Back: *a. Ground:*

Green, made by a design of green, blue and ochre lines. In the watermark zone is a "harlequin pattern" rosette with the numeral "500".

b. Printing:

Black.
In the middle of the note and to the left is a vignette of a lizard drawn by the artist Ib Andersen (1907-1969).

Above the lizard's head to the right is a guilloched rosette with the numeral "500". In the horizontal band below the vignette is a panel of lettering, "Femhundrede" and "500 Kroner", displaying various structures of machine engraving.



1000 KRONER

Series 1972

Note issued
11th March 1975 by the
Danmarks Nationalbank

Size: 94 x 176 mm.

Paper: Cream coloured.

Watermark: In the left hand side of the note is a watermark zone with a double portrait of the painter Jens Juel and his wife after a painting by Jens Juel and the numeral "1000" vertically repeated.

Security thread: In the right hand side of the note a security thread is embedded into the paper. The thread is always visible when the note is held against the light.

Face: *a. Ground:*

Grey.
Under the numeral "1000" is a vertical "harlequin pattern" ribbon. In the watermark zone "Danmarks Nationalbank" is printed in grey.

b. Printing:

Black (series in blue and number in red).
In the middle of the note slightly to the left is a guilloched rosette with the numeral "1000". On the right hand side of the note is a portrait of Mrs. Thomasine Heiberg, née Buntzen, later Mrs. Th. Gyllembourg, after a painting by Jens Juel (1745-1802).

In the white horizontal band below the rosette and portrait runs a line of engraved script, "Tusind Kroner".

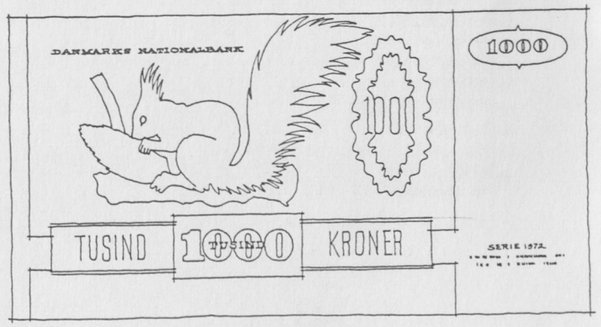
Back: *a. Ground:*

Grey.
In the watermark zone is a "harlequin pattern" rosette with the numeral "1000".

b. Printing:

Brown.
On the right hand side of the note is a guilloched rosette with the numeral "1000" and on the left hand side a vignette of a squirrel after a water colour by the artist Ib Andersen (1907-1969).

In the horizontal band below the rosette and vignette is a panel of lettering "Tusind Kroner" and "1000 Tusind" displaying various structures of machine engraving.



Explanatory List of Names and Terms

Acanthus engraving, (among English speaking professionals commonly referred to as "scroll-work") a specialized form of decorative free-hand engraving, usually playing a secondary rôle and mostly applied in subordinate parts of the note design. Most frequently the subject matter is some more or less imaginative sort of acanthus foliage from our common classical heritage of embellishment as seen in Greek and Roman High Antiquity (and later stylistic derivations therefrom). Also fruit, swirling ribands and other items are now and then used for this, and the themes may even be pure non-representational abstractions. It differs significantly from the principal parts of free-hand engraving by being decidedly more "bound" or "calligraphic" in its features of free-hand burin work. The special purpose of this kind of work in security graphics is to display the characteristic effects of elegantly disciplined arrays of meticulously designed curved lines with accentuated variations of proximity and gradually alternating boldness of engraving, forming the desired effect of foliage, fruit or whatever it is intended to represent. Thus the final outcome depends on nicely designed and controlled burin work of the "writing accent"—or "flourish"—character for which such motives are specially well suited. This particular sub-section of engraving has very often been degraded to dull routine, merely used as a handy means of "filling-in" various voids and as an habitual way of adding finicky, and often quite superfluous, "transitory" embellishment. But there are also very well motivated and masterly engraved applications, some of them even very impressive, and in exceptional cases downright dominating (e. g. the large back ornaments on former Argentine notes). See further text and illustration to no. 22, where a brilliantly executed example is shown.

Andersen, Ib (1907-1969) Danish artist and architect, an exquisite draughtsman. He has drawn originals for many pictorial parts of Danish banknotes. Most of the animals on the new series and all the landscapes on the now expiring series are by him. See page 42.

aquatint. Under this heading comes a plurality of various graphic techniques that are all tonal etchings upon metal plates. The recipes and the execution may vary considerably, but common to them all is the principle of the metal being covered by a protective, acid-resistant, layer called an *etching ground.* In the various techniques of a. this etching ground has deliberately been given a grained structure of insufficient covering strength (e. g. by means of mixing-in an evenly dispersed amount of alien matter: cloth dust, sugar grains etcetera or by simply spraying or spattering the protective material onto the slightly roughened metal surface) so that the acid when applied will penetrate the ground layer and bite the underlying metal in accordance with the structure of the "prepared defects" that actually form a perfect structure of minute specks. The artist creates his picture by gradually etching and gradually "stopping out" or covering the metal surface by means of some varnish or bitumen compound that prevents further etching where it has been applied. In this way the artist can build up his tones step by step. The more he etches any given area the darker it will print. Areas that are to remain white in the final print are stopped out in advance so that they are not etched at all. When the artist has thus completed all his tones all protective layers are removed and the plate is ready for print (by inking and wiping, exactly like the printing of line engravings.) Famous works in this technique are for instance Goyás series "Desastros de la Guerra" and " Los Caprichos", and in Britain of course Th. Rowlandson's numerous graphic works that can be seen in almost any public collection. In our time the technique has been practised exquisitely by Picasso.

Ara Pacis (or ara pacis Augustae). Stone altar of Roman Antiquity, Originally erected 13-9 B. C. in Rome as a sacred monument of "the Great Augustaean Peace". It has now been re-erected in a small special museum of its own. The marble sculptured floral ornamentation upon it is of such delicacy and incomparable grace that is has since become a stylistic concept of its own, "The Ara Pacis Style", which has, over the centuries influenced the ornamentation of numerous works of Italian art and art industry in a grand way.

bas-relief, relief of very low projection from its basic plane (usually the differences of work level in a b. are sufficiently shallow to allow casts to be made without any problems of the mould interlocking!) In security graphics small b. are often used as original master plates for *relief engraving.* See page 20 and 21.

Bellotto, Bernardo (1720-1780). Venetian veduta-painter and -engraver. Nephew and pupil of Canaletto (whose name he often assumed!) The very precise architectural and topographic representation of European capitals and large cities is of so remarkable fidelity that his works were used as reference when the devastated historical parts of Warsaw after World War II were reconstructed, nearly 200 years after the pictures were made! The comprehensiveness, and precision of even minute detail in such vedute is, artistically, the direct forerunner and prerequisite of the way such themes were later treated in security engraving, where etched and engraved representations of buildings, monuments, street scenes and landscapes reached a high degree of perfection especially in some British and Central European firms, and in the United States.

Bewick, Thomas (1753-1828) English engraver, an eminent draughtsman especially of animals. He "revived" wood engraving by returning to—or rather "re-inventing"—the 15th century works of Urs Graf and creating a style entirely of his own, with a very eloquent graphic rendering of light and material that was hitherto unseen in woodcuts. Examples in his "Fables" and in numerous later reprints. The Victoria & Albert Museum in Kensington has some of his blocks. There are further works in the British Museum, in the Courtauld Institute and a rich collection in Newcastle where he came from. Occasionally B. also did money representations in the form of various credit bills, promissory notes and other fiduciary prints for various smaller banks etcetera. See further: *Xylography.*

Biilmann Petersen, Gunnar (1897-1968) Danish architect and graphic artist. The first to be appointed professor of applied graphic art at the Royal Academy of Fine Arts, Copenhagen. He has contributed essentially to Danish banknotes, especially to the series that is now being superseded.

black-line work. In the present context the term is exclusively used of guilloches (i. e. geometrical lathework) where the lines appear in ink upon the white paper, as opposed to *white-line work,* where the lines appear in pure paper whilst the spaces between them are inked. This limited usage of the word is adopted in this book only in order to distinguish between the two guilloche forms. (Apart from this the term bl.-l. may of course generally refer to any hand or machine engraved print with inked lines on white paper.)

burr Apart from its traditional meanings the word is used about the little, jagged wall of surplus steel that clings along the edge of an engraved line because the material is thrown up by the burin as it travels in the surface (like the raised part of a ploughman's furrow). In many art forms the burr is left as it is and takes part in the effect of the final print, but in security engraving such raised material must be carefully removed in order to preserve a nice surface to the plate and a clean "shoulder" to the line (for the sake of flawless and uniform wiping of the ink). Taille douce (i. e. classical copper plate engraving) when properly done does not present this problem, because surplus material comes off in clean-cut shavings that are easily removed.
Used as a verb the word means not to make a burr, but to *remove* it.

"Casa de Moneda", colloquial term for Fábrica Nacional de Moneda y Timbre, the Spanish security printing works and its museum of coins and banknotes etcetera (open to the public) in Madrid, Calle del Doctor Esquerdo no. 36.

Cellini, Benvenuto (1500-1571) Florentine sculptor, goldsmith, draughtsman and scribe. His famous autobiography conveys abundantly, and with unrestricted self-pride, his knowledge and ability as an artist and metal-craftsman.

Claude (see Lorrain, Claude).

Clemens, J. F. (1748-1831) Danish engraver. At the age of 11 he was accepted at the Royal Academy as a student of painting, but devoted a great deal of his efforts to copperplate engraving. There he met the engraver J. M. Preisler who was by then a mature artist in his middle thirties and who became Cl.'s guide and teacher. Cl. was granted a 3-year voyage to Paris where masters of international fame like Wille and Delaunay became his teachers and where Cl. was finally about to be appointed a member of the French Academy of Fine Arts when he was recalled to Denmark. As a copperplate engraver he actually already by then enjoyed widespread respect and repute in several countries. Back home again he suffered somewhat under the disillusionment of not being accordingly recognized and adequately appreciated in his homeland, and consequently some of his best years were wasted upon silly little commissions ordered by influential officialdom. (Bleak little delineations, bared of true pictorial interest, representing neat little neoclassicist monuments in various Royal palace gardens and the like. A deplorable mismanagement, considering the stately and refined works of engraving he was capable of turning out, often based upon originals by his friends Abildgaard, Lorenzen, Eckersberg and above all Jens Juel.)

composite work, the fusing of several security engraving techniques into one item. As shown for instance in illustrations no. 7 and 11 this can at times be worked into very complicated effects.

Crivelli, Carlo (?- about 1495/1500) Venetian painter. That he was an exquisite colourist is not so relevant here as the fact that he was one of the precisest and most well-defined draughtsmen of early North Italian renaissance. The linear definition, also in the rich, magnificently painted floral and animal detail of secondary parts is extraordinary and of an engraver-like sharpness, reminiscent of that of his great contemporary, Mantegna (who, by the way, actually *was* an engraver in between his other doings). The most important works of Crivelli are in the Louvre, Paris, in the Brera, Milan and above all there is his marvellous "Annunciation" in The National Gallery, London. They all show superbly observed and analysed natural detail for instance in his magnificent garlands. (Actually his splendid peacock in the mentioned annunciation picture was one of the incentives that caused the idea of using animals for the new Danish banknote series!)

crossing quality. When examining a banknote under a strong magnifying glass or a weak microscope (not more than 10 or 25 x) one will often find that a clear and well-defined reproduction of crossing lines is a fairly reliable criterion of good quality printing from engraved original plates. The effect of this even to the naked eye, is especially conspicuous, where larger systems or entire areas of line crossings appear in some regular or systematic plurality, as for instance in cross hatchings, machine engraved rulings etcetera, and also in guilloches, both black-line and white-line. Counterfeit notes will often be particularly lacking in this respect. See illustration no. 1 and see also the effect of the minute crossline shading to the letters HUNDREDE in the riband of illustration no. 4 as compared with the same shading upon the counterfeit note in illustration no. 6.

Cruikshank, George (1792-1878) English engraver and draughtsman. Immensely popular. He was a beloved political cartoonist and illustrator (of Dickensian fame) and he depicted his contemporaries in a prolific production of works for mass publication. When his "Bank Restriction Note" was published 1819 (or perhaps late in 1818) there was a traffic jam in Ludgate Hill because people thronged in masses in front of the print seller's in order to buy a copy! He took a charming (but somewhat unfounded and surely exaggerated) pride in underlining the influence of his own spectacular participation in public debate of current political and moral issues. Later in life he maintained, without blinking, that his bank note was the direct cause of ending the death penalty for the passing of forged pound notes. There is a funny discord between this and his artistic humility or even timidity. (He knew well that he was no great artist, and even as an old man he was pathetically doing art-student's drawing studies because he was deplorably lacking in artistic education.) Yet he knew

and felt that his numerous fans never bothered with artistic merit, and his peculiar outward pride made him seriously maintain that Charles Dickens wrote "Oliver Twist" mainly as a sort of embroidering prose text around his illustrations!

"deep print", a purely home-made term used in this book only as a handy label for all printing techniques that have their printing (or image-carrying) parts *below* the surface of the printing plate. The professionally correct term is "Intaglio", an Italian word, that simply means "cut down into". It comprises both etched and engraved forms but only those that print, not from the surface, but from etched or incised cavities in the plate.

"Detectors". Instructive leaflets and other informative publications, often in the form of handbooks, both large ones and pocket editions, intended to guide the public in recognizing spurious banknotes, which were appearing in increasing numbers especially in the 19th century. The most famous among such publications is Laban Heath's *"Government Counterfeit Detector at Sight"* that came in many editions. It contained authorized part-illustrations and separate details, printed directly from the official originals (with clear cancellation marks!) and some editions, for comparison, also brought direct prints from actual forgery plates, confiscated from the workshops of arrested counterfeiters.

diesinking, concave sculpturing in steel, used for casting various print mediae, but also for embossing paper (often combined with inking, frequently in gold print). The traditional field of motives is heraldry, symbolic animals, coats of arms, etcetera.

diestamping, high-pressure printing from deep and sharp steel engraving used for exclusive stationery, finer business cards, visiting cards etcetera, and often in combination with the above mentioned *diesinking*. In principle this is very close to banknote printing, but far more ostentatious and much less nuanced. It would never stand the vicissitudes of handling and common circulation. Often the printing plates are but little larger than the motives so that the paper is calandered to a hard, marble-like surface gloss in the immediate surroundings of the printed image.

Draper, John (1770-?) American engraver from the heyday of security graphic pioneering in North America. In 1794 he was employed as an illustrator with an editior, Th. Dobson who was preparing an American Encyclopedia in Philadelphia, where Dr. met his newly immigrated colleague Murray in 1803. See Murray.

drypoint, the most direct and least complicated of intaglio techniques. It consists simply in drawing or scratching with an engraver's needle directly in the metal plate (mostly copper) and eventually to ink the plate, wipe the surface clean exept for the grooves and then print it as it is, burr and all. So there is no etching procedure involved. In French the method is called "point sec" and in German "Kalte Nadel". Among the famous artists in this technique is Rembrandt who did both drypoint and etching. Many an excursion around Amsterdam was thus reflected in miraculous little prints of landscapes and figure studies because he frequently went about with his needle and some small copperplates that he used for scetchbook. See further *etching*.

Dürer, Albrecht (1471-1528) German painter and engraver. Further presentation is scarcely necessary. He belongs to the history of world art as one of the greatest figures of German renaissance. But to many people of our times his universal fame as a painter may overshadow the fact that Dürer exerted by far the largest influence upon his time not as a painter but as a graphic artist, in his woodcuts and engravings in copper, iron, etcetera.

eccentric, the word is used here solely in its technical or geometric sense: A circular disc is said to be eccentric when it rotates, not as a common wheel, but around a point that is *not* in its centre.

enskilda banker. Private banks in various provinces of Sweden. In the eighteenth and nineteenth centuries many of these banks, and also some merchants and private trading firms, issued their own banknotes that circulated on equal footing with the official ones, and this practice was not discontinued until as late as in 1903.

etching is the common heading for a group of graphic art forms where the lines, by means of acid, are *etched,* not engraved, down into the plate. Hence its French name *eau forte* ("strong water" i. e. nitric acid). The completed plates are inked, wiped and printed in the same technique ("intaglio") as engravings. The metal plate (mostly copper, but also iron, brass, steel, etcetera, are used) is covered with an *etching ground,* a protective layer of some compound (there are many different sorts) that the acid cannot penetrate. The artist then draws his lines with a needle in the etching ground so that the underlying metal surface is laid bare and the subsequent application of acid will cause the lines to be etched. The strength of the acid and the duration of the bite determine the depth of line, and the artist can vary the lines not only by using an assortment of finer and broader needles but also (as in *aquatint*) by stopping out certain parts of his drawing with bitumen so that some of the bared and slightly etched lines are sealed off from further attack of acid while other parts (that are wanted darker still) continue to be etched. Some acids throw a burr to the line, others do not. There are infinite possibilities of variation in this technique and line etching may be combined with tonal etching where not only the lines but also various parts of the blank surface are attacked and will appear tinted in the print. Each single print will be a signed and numbered work of art in its own right, and consequently such forms of etching are completely unfit for security printing. Many of Rembrandt's portrait etchings for instance exist in beautiful, but widely different prints, from various stages of work and various degrees of inking and wiping, all from the same plate!
As a means of artistic expression the prime distinction between etching and engraving lies in the tools used: the linear work for an etching is done by means of *a needle,* held in the hand like a pencil and used in the same way as in common drawing or writing (i. e. popularly explained "from the left to the right hand side") whereas the engraver's *burin* or graver is held inside the hand, guided by the fingers, its rounded wooden grip resting firmly against the base of the hand while it is slowly being pushed "from the right towards the left hand side" as the carefully planned line is meticulously being "carved out". Thus the needle as used for etching permits much greater ease and freedom for improvisation in the line work, and the virtues of the burin as used for engraving are calm, discipline, deliberation and a high degree of control.
In former days etched "needlework" was very much used for various decorative and ornamental parts of banknote

design, and even to-day it forms large parts, especially in pictorial vignettes etcetera, but always when used in security work, its above-mentioned "capricious" technical tendencies must be kept rigidly under control for the sake of uniformity in the final prints.

etching ground, (see *aquatint* and *etching*).

Fairman, Gideon (1773-?) started out as a blacksmith, but eventually he completed an apprenticeship as a jeweller and goldsmith. At the same time he studied and practised engraving as a hobby, far beyond the traditional demands of the goldsmith's trade. Around 1810 he came to Philadelphia where he met the 4-5 years older colleagues Draper and Murray and joined them in founding a firm that bore their names. Fairman's contribution to this "engravers' collective" was a series of excellently engraved portraits, among these two of George Washington, based upon Stewart's famous oil painting. F. was among the American specialists who were invited to go to the Society of Art's hearings in London 1818. He remained there and founded a firm (together with Perkins and Heath) that principally devoted its business to postage stamps.

Finiguerra, Maso (1426-1464) Florentine goldsmith and "picture-master". He is said to have been an excellent niello-artist. Almost none of his works have survived till our times. Vasari claims that F. invented the art of print engraving inasmuch as he pulled prints from his chiselled and engraved plates before completing his sulphur compound incrustations. (This was, however, done in Germany, and in Italy as well, a long time before.)

"flat print", here used as a popular term for all the printing techniques that have their printing parts or image-bearing elements in the same or nearly *the same level* as the non-printing parts of the plate.
Originally all of these techniques were some form of lithography, or "stone print" that only accepted ink where the stone surface was greasy and repelled ink where the surface was watery or prepared with some weak acid-solution. All modern methods of "flat print" are based upon this principle of antagonism or repulsion between water and grease, but nowadays stone surfaces are hardly ever used but for rare, artistic purposes. The word *lithographer* (literally: "he that draws upon stone") and the words *lithography* and *lithographic* have become separated from their true origin and are indiscriminately used about all later methods of flat printing regardless of the fact that their printing plates are all made of some combination of metals (copper, steel, zink, aluminium and others). In jocular talk you may even hear the tautology "in the Stone Age of lithography", and in common professional talk the abbreviation "Litho" almost invariably refers to modern offset printing. (See *lithography* and *offset printing.*)

flow-etching. An area of line structures (needle-drawn, guilloched or machine-ruled) in an etching ground is said to be "flow-etched" when the acid is applied in such a way that the tonal strength of the lines is varied into gradually darkening or fading effects. This is achieved by giving the lines a certain amount of alternating depth either by way of carefully calculated differences in the duration of the acid application (which gives a high degree of control over the result) or by way of applying the acid with a soft watercolour brush in a freely floating, weak watery solution in which the process is much less controlled, but may yield very elegant effects of vignetting-off (for instance of sky-tones over a landscape etcetera.) The result of such etchings may be pretty near inimitable, even to the same engraver. During the nineteenth century and right up to World War I this technique was also frequently used in finer commercial plate printing (Factory prospects or allegorical figures upon letter headings and in finer illustrations etcetera).

flourishings (or flourishes), secondary embellishments in the form of decoratively curved pen strokes, often surrounding engraved lines of lettering. Their origin, of course, lies in the quill-written letters and documents of old that were often richly ornamented and also frequently had simple margin "tests of the quill", occasionally in the shape of small drawings with neat handwriting accents, where the writers tested their tools before coping with the text itself. Writers in the Papal Court, in the Vatican Library and also increasingly in secular life cultivated this little art form of its own. In several countries (Spain, France, England and others) there were small clubs or societies devoted to "penmanship" for its own sake. This calligraphic sport was often taken to quite impressive extremes of virtuosity, right into completely illegible creations, often with the result that crucially important words (for the understanding of the text) were emphasized with such elaborate ornamentation that instead of being stressed they were nearly drowned in a wilderness of beautiful but meaningless waves and irrelevant curves! At times such flourishings were combined into complete figure drawings of birds or mounted knights in armour, with helmets and billowing plumage, all made in hand written flourishings! But quite apart from such excesses it is readily understandable that this little specialty exerted its charm and appeal to engravers as well. The V-shaped burin in the soft metal is eminently fit as a medium for these graceful combinations of the basic elements of script engraving: the finely engraved curved line gliding into a bold and deep passage of accentuation and again vanishing finely as it began. And in fine security engraving this is sometimes done with incomparable elegance, as discreet additions to the effects of lettering, and occasionally also as large, predominant and brilliantly designed items of the composition. In our times the security value of fl. must not be overrated, but when they are engraved with true emphasis on their natural æsthetic qualities and printed in colours of good gradation their effect can be a commendable and positive detail in the totality. Used in offset or letterpress they merely become meaningless "decorative" padding. Their true nature is engraving. Among the illustrations in this book there are two nice little examples in no. 2 and in no. 18.

Gertner, Johan Vilhelm (1818-1871) Danish portrait painter and draughtsman. His teacher, the famous Professor Eckersberg rated him highly for his precision and gift of characterization. G. was of a cantankerous, belligerent and difficult nature. He did nothing to please, let alone flatter, his sitters if he did not like them, were they ever so elevated in rank or common esteem. His degree of sympathy or antipathy for each single one was clear and manifest in the result! As a painter he was also a hard and unpleasant one, rather banal and untalented as a colourist. But as a portrait draughtsman he was exquisite. Dedicated or merciless, but always bang-on for directness and precision, frequently even insultingly honest. The hand drawing that served as original for the engraving in illustration no. 4 (The Danish 100 Kroner note of 1962) is a fine and am-

iable example of the outcome when G. really accepted the personality of his sitter and went in for him with appreciation and sympathy.
Some of his finest drawings (that were merely meant as preliminaries for painting or lithography) will doubtlessly remain among the most important works of quiet, but penetrating portraiture ever done in our part of Europe.

Giambologna, or Giovanni da Bologna, or Jean de Boulogne (1529-1608) Italian renaissance artist. In his time he was undoubtedly the most famous of Florentine sculptors (both of his illustrious predecessors, Donatello and Michelangelo were dead). In the present context G. is merely mentioned *en passant* together with Verrochchio, Ghiberti and others for their eminent knowledge of metal that plays such an important, and not commonly appreciated, rôle in the admiration of their work. Old Cennini tells us that within the guild of their composite craft (jeweller, goldsmith, engraver, picture-maker and sculptor) the traditional, common term of apprenticeship was 13 years! And it was considered a grave defect in any work of art if it should be lacking in professional qualities, (e. g. Michelangelo's merciless derision of Leonardo's unfortunate and eternal experimentations that often led to a deplorable lack of unison between work and material!)

Gobrecht, Christian (?) security graphic technician in the first decades of the 19th century. Not much is known about him, but he is said to have been the one that brought Asa Spencer on to the idea of the Geometrical Lathe. G. contributed essentially to the invention of the relief engraving machine.

gradation (or "Stufigkeit"). Different printing inks used for banknotes show different degrees of *ability to display readily visible effects of the varied line depths* in the original engraving. This ability of the ink is called its *gradation.*
An ink of good g. will show significant differences in its appearance where deep-cut lines of engraving causes it to pile up and cover the paper in bold, full-coloured lines whereas the same ink will show thin and shallowly engraved lines with a marked degree of lightness, due to its higher transparency in thin layers.
An ink of poor g. will print with an approximately uniform degree of covering strength all over, regardless of the depth differences in the engraving. (Many an engraving of somewhat mediocre quality in this respect has been "saved" by being printed in colours of poor gradation!)
Thus, theoretically at least, an *absolutely black ink has no g. at all.* But in practice it will often show degrees of suggestive greyness (or even of some slightly *colour-tinted* greyness) in shallow engraving as opposed to its rich black fullness in the boldly engraved parts.

Greuze, Jean Baptiste (1725-1805) French "parlour"-painter of narrative genre pictures. His artistic background was the late crop of Dutch popular genre painting (Teniers I-II and others) and G. recultivated this field during his entire, and very prolific, career as an artist. He exploited the Rousseau-inspired wave of popular sentiment by turning out an impressive number of slick and beloved "folksy" renderings of the virtues of daily life of the poor or commonly modest strata of society. At a certain period he was immensely popular and his pictures spread to thousands of homes via the engravers, who made good profits upon the crest of this modish wave of emotionally appealing themes. The utterly desolate look in the face of the tearfully sobbing "Little Girl with Crushed Jar" has moved millions of admiring spectators. And a lingering echo of his ideas (along with a deplorable heritage of his rather miserable, but also somewhat slick and effete, draughtsmanship) can be traced in the choice of motives for numerous vignettes of the 19th century. His pictures are still found (but no longer so prominently hung) in many French provincial museums, but also, mainly for reasons of art history, at the Louvre in Paris, as well as in London, both at The National Gallery and in the Wallace Collection.

guilloche, "rose engine work", machine engraved linear ornamentation, made by means of the geometrical lathe. It often consists in *one* single, but very complex, waved curve that intersects itself in a systematically arranged multitude of crossings. The course of this line is governed by a system of mechanical guidance, comprising gears, eccentrics and cams. Several g. may be placed on top of each other, and they can be made to print both as "blackline work" and as "white-line work"—*and* in various combinations thereof. In American usage they are occasionally referred to as "Spencerian curves". More extensively dealt with in the main text page 15, 16 and in the comment to illustration no. 12.

"high print". Although the term is entirely unprofessional it is used here (together with "deep p." and "flat p.") to describe in a simple way one of the three different main principles of printing. Thus "h. p." refers to all printing techniques that have their ink-carrying (or image forming) elements *above* the non-printing surface. Common letterpress printing is "h. p." and so are woodcuts, linocuts and the like.

intaglio is the correct professional term for all techniques of "deep print", without specifying whether the plates are engraved, etched, chiselled, punched or produced in any other way. The criterion is that all inked parts of the picture are *below* the printing plate surface level. The surface itself is consequently wiped clean of surplus ink before printing. The word is Italian and simply means "cut into".

Juel, Jens (1745-1802) Danish painter. As a portrait artist he is one of the relatively few Danes that have reached a certain international repute. There are pictures by him in Leningrad (Hermitage), Hamburg and in London (National Gallery). See the pages 41, 46 and 47.

kaleidoscope, a tube with a built-in arrangement of mirrors, that enables the user to view some coloured beads or other objects in a mirror-reflected, symmetrical pattern within a circular field of view when the apparatus is held against the light and the eye is looking through a peephole in the rear end. By turning the tube, the beads will rearrange their relative positions, and the entire pattern will change accordingly. Mostly used as a popular toy. In finer models the mirrors are adjustable and the objects interchangeable. The peephole may be mounted with a magnifying lens. Its capacity to form intriguing decorative patterns is infinite.

Larsen, Johannes (1867-1961) Danish painter and graphic artist. As a nature-observer he is the grand old man in Danish art. His studies of bird life were at the same time works of expert ornithology and of great art, of a direct and plain simplicity that found its particularly straightforward expression in whichever medium he chose, be it brush, pencil, crayon, pen or cutting tools. Each of his

numerous book illustrations in pen-drawings or woodcuts is done quite uncomplicated, as a matter of course.—They are masterpieces of simple artistic authority. The eider duck upon the back of the new Danish 10 Kroner note is an engraved, but multi-colour offset printed reproduction based upon a watercolour drawing by J. L.

"lay-in", an initial stage of the free-hand engraver's work. By means of a very shallow (non-printing) design of very thin needle lines he decides upon the curvatures, directions and the degree of dispersion of the various structures as they are ultimately going to appear in the final print.

letterpress print, the most common form of "high print", text is printed from ordinary, cast printing type and pictures from raised printing blocks. The ink is placed on top of the image-bearing parts, that are *above* printing plate level.

lithography, method of printing from plane surfaces of stone. This technique was invented in 1798 by the German playwright Alois Senefelder, who had difficulties in finding an editor and printer for his manuscripts and therefore sought ways and means of printing them himself. This was the direct cause of the invention of l. In the course of his struggles he came upon the idea that resulted, not in the desired literary success, but in the discovery of a revolutionizing technical principle in graphic reproduction. He found that designs made by means of greasy drawing ink upon plane stone slabs could be treated with a weak etching solution in water, and when eventually a roller with oily printer's ink on it was passed across the surface, the ink would stick to the grease impregnated design areas *but would be repelled from the bare, acid or water impregnated areas.* He found that this old and well-known principle of antagonism between oil and water could be used for printing and that this gave an astonishingly perfect reproduction of the picture drawn upon the stone.
Already during the first decades of the 19th century the method was refined so much that it had developed into a proper craft in its own right. It became a distinguished trade and three separate methods had emerged, all of them based upon Senefelder's fundamental principle of Water versus Grease. Artistically these three original techniques are decidedly different, according to the structure of the stone surface and the tool used upon it:

1. *pen lithography,* drawn by means of a pen or brush upon a common, plane-ground surface of a Solnhofener lithographic stone.
2. *crayon lithography,* done upon a lithographic stone with a (finely or coarsely) grained surface structure, obtained by means of a sand-grinding and drawn with a soft, very greasy kind of special crayon. (This is the technique preferred by Daumier, Forain and Toulouse-Lautrec).
3. *lithographic engraving,* done upon a mirror-planed, highly polished surface of very hard limestone (the finest are of Greek origin). When the surface finish is absolutely perfect, it is covered with a matt, blackish layer of a compound of water, graphite, gum arabic and salt of sorrel. The picture is engraved right through this thin cover with various calibres of sharply pointed or spear-shaped engraving needles (not burins!) and the work is taken slightly into the stone itself. Great care must be taken not to disturb the layer in any other way. When the engraving is finished it stands like a light grey negative upon this dark protective ground. The engraving is then filled in with greasy lithographic ink by means of a tampon that presses the ink down into the bared design, and finally both the ink *and* the layer is removed. The stone can now be treated and printed like an ordinary lithographic original, but the result is of a definition and sharpness that can neither be drawn, nor metal engraved or photographed with such excellent perfection and cobweb-fine elegance in any other technique. Engraved lithography is completely unfit for security graphic purposes. Its virtues of delicacy and finesse are much too fragile to be maintained as a production standard for large emissions of printed matter and their airy qualities would be too vulnerable to the creases, wear and dirt involved in the life of a banknote. Also it is not suitable in combination with other kinds of printing that inevitably look coarse and domineering in comparison.

Technically lithography is the origin of all later kinds of "flat print" (see this).

Lorrain, Claude (1600-1682) French painter. His real name was Claude Gellée. He came from Lothringen and is therefore in most countries called Claude le Lorrain. In England he is just plain Claude, and the Italians call him Lorena. His works are of exceptional poetic beauty. In his landscapes the effects of light and distance, and his handling of atmospheric gradations of tonalities are of eminent care and precision and have gained him an everlasting fame in the history of art. His impact upon the art of landscape painting is enormous. In England for instance he is the direct artistic prerequisite for Turner. His pictures have served as originals for engraved interpretations by the hundreds. His personal catalogue of his own oil paintings (with hand drawn illustrations!) is called the Liber veritatis and is in the British Museum in London.

Lundbye, Johan Thomas (1818-1848) Danish painter of landscapes and animals, one of Denmark's most candid and sensitive draughtsmen. In the leading museums of his country and in The Royal Print Cabinet in Copenhagen he is represented by some of the finest landscape and animal drawings ever created in Denmark. The xylographers' interpretations of his illustrations for popular poems about animals enjoy well-deserved and widespread fame, but especially his hand drawn originals are of unpretentious artistic beauty.

machine engraving, mechanically engraved (frequently etched) line structures, whose degree of regularity (or calculated variance) depends upon the fact that the cutting tool (diamond or steel needle point) is governed by precision machinery. This mechanical arrangement governs the width of the *interval between the lines,* their *lengthwize* design is governed by interchangeable rules, that may be straight or curvilinear.

mezzotint is an Italian word, that simply means "half tone". The term is mostly used (with some indiscriminate lack of precision) of ordinary letterpress screen blocks *and* also of the various forms of intaglio where gradated intermediate tonalities are achieved by variegated depths and bottom structures in the tonal areas. The latter sense is the original one, and throughout this text the word has been used according to this.

Murray, George (1769-?) Scottish engraver, served his apprentice years in London and around 1810 he went to Philadelphia in order to assist the editor, Draper was working for. In 1810 he was one of the founders of Murray, Dra-

per, Fairman & Co., a firm that introduced as their fundamental theory in security graphics the idea of selecting the top-grade specialists within each single speciality and let them perform these collectively, each of them doing his bit upon the same original printing plate.

Nanteuil, Robert (1623-1678) French engraver. Among the outstanding portrait engravers around the court of "le Roi Soleil", Louis 14, the most prominent ones were R. N. and the Flemish artist Edelinck. (In Denmark we had at the same time, at the court of Christian 4, another excellent Fleming, the engraver Aelbert Halwaegh.) Apart from the clear and well-defined burin technique of which the cover illustration of this book is a lucid example N. also created free and temperamental needle etchings of great graphic impact and perspicacious psychological observation. Among them is for instance an etching of Louis 14 of swift and sovereign virtuousity. But the predominant part of his works are in the cover illustration's "bound and disciplined" style of carefully administered "manners" in the burin work, an art of engraving that still stands as an apex in a grand tradition that was to be carried on without decline by masterly successors right through l'ancien régime (Drevet, Pouilly and others) and, technically at least, this lingered on even to the latter end of the 19th century. Nowadays it survives practically only within the field of security engraving.

needle work, (see etching).

niello, (from latin nigellus: blackish) a technique of ornamentation upon gold, silver and other metals. Incised lines are filled with a black liquid (of sulphur compounds with silver, lead, copper, vismuth, etcetera) pulverized and dissolved in salmiak, heated till the point of liquidity and, subsequent to hardening down in the incisions, it is scraped clean and the surface is polished with brimstone, leaving a black ornamental design in the blank metal. The technique is very old. It was known in ancient Egypt, but reappeared in the 12th century in Germany and Italy (see Finiguerra). The Russians are experts, especially in Tula ("Tula works").

offset printing, (see further "flat print" and lithography). All forms of "flat print" that are put on to the paper not directly from the printing plate but via a rubber blanket are called o. (This book is printed in o.) If this transmission is made from "high print" it is occasionally called "letterset". In our time o. is probably the most used and most widespread of all the printing techniques as it has during the last decades taken over a steadily increasing part of magazine and newspaper production as well. In security printing it is much used for high quality secondary print (colour plates, ground tints etcetera) upon bonds, shares and banknotes. Among the illustrations in this book the one on p. 17 (of a pendulum-guilloche) is the only one reproduced in a directly applicable banknote quality of offset printing (size 1:1), and you will enjoy taking your magnifying glass to it!

"Operation Bernhard" (also called Operation Cicero), one of the largest attempts at banknote counterfeiting in World History, instigated by the Nazi leaders during World War II. By means of a selected medley of captive specialists and also of experienced criminals from occupied countries the scheme was carried out clandestinely in the barbed-wired and extra rigorously guarded domains of the notorious barracks 19 in Sachsenhausen Concentration Camp near Berlin. The attempt was primarily directed against the British Pound, but also US dollars were imitated. The intention was an economic warfare designed to undermine Great Britain by flooding her with spurious notes. The planned distribution by way of parachutes had to be discarded because the Germans had lost the necessary airforce long before the gigantic emission was ready for it.

pantography, repetition of a drawn or engraved linear design in diminished or enlarged form. (In security graphics often diminished to extremely minute proportions. See illustration no. 8 and 10.) The process is carried out by means of an apparatus called a *pantograph,* in principle a very simple, but nicely constructed mechanical arrangement of movable bars or adjustable steel beams. One of the first to construct a p. instrument specially designed for security work was Cyrus Durand in New York around 1824.

perception psychology, the part of psychological research that is centered on sensorial perception and the pertinent further processes in the various parts of the brain. This is one of the basic research fields of psychology, and in the present context it is of course primarily the visual perception and the aspects of attention and discernment that are of importance (in general principle as well as in individuals at different degrees of age, intellectual and sensorial stage of development etcetera.) In several research centres around the world extensive programmes of research have been conducted over the last 40-50 years, and substantial grants have been allocated to this, e. g. in the fields of advertising, military use, development of traffic signs, design of printing type etcetera but also certain central banks have embarked upon research schemes on an advanced scientific level to discover what it is in a banknote design that people notice and which enables them, perhaps subconsciously, to recognize a counterfeit. But in fact professionals have been occupied with such considerations long before the idea of disciplined and planned research was introduced in this field. Many of the pioneers in security graphics have, totally without such formal scientific qualifications been very conscious about these matters. (See for instance picture and comment to the composition and design of lettering etcetera in illustration no. 19.)

Perkins, Jacob (1766-ca. 1830) was one of the prominent figures within the circle of security graphics people that formed the school of thought, set the principles and also devised the technical means in the first decades of the 19th century. His major achievements are more extensively dealt with in the main text, but in addition to those he also made many valuable detail improvements (it was he who first devised the practice of inking printing plates for engraving by means of rollers instead of the former use of tampons.) His leading maxim was that of *uniformity,* not only of the printing plates themselves, but also the uniformity of repeated elements upon the single banknote, and he planned a sort of "uniformity key", though the principle of this has later gone out of use. His line of thought was more technically perfect than æsthetically valid. He also outlined new methods of combining several printing techniques upon the same banknote. He died in London as a co-founder and co-owner of the postage stamp printing works that he built there together with Fairman and others.

perspective return (imaginary), an imitated effect of perspective, frequently used in engraved banknote lettering. From

shop signboards and mounted monumental inscriptions upon architecture the effect of a thickness dimension is a well-known and completely natural function of the letters genuinely having a projective dimension. But in engraving (i. e. to be printed on flat paper) this effect is of course illogical but still very much used, already from an early stage of security graphics because it gives an effective and very inviting scope for linking various sorts of engraved tonalities and structures of shading directly with the legend of the note. The illustrations no. 2, 3, 4, 5, 6, 15, 16, 19, 20, 21, and 22 show examples galore, both in genuine and forged versions.

photogravure is a modern, photographically screened version of "deep print". When printed on rotary presses it is also called *rotogravure.* Occasionally, but very rarely, used for banknotes (emergencies) but increasingly common for postage stamps.

Picasso, Pablo Ruiz (1881-1973) Spanish painter who lived most of his life in France. Further presentation is surely superfluous: in the art history of the 20th century he is a figure of renaissance-like proportions. Pertinent to the theme of this book is only a short mention of the fact that P. among his numerous and versatile activities has made masterly etchings, drypoints and aquatints.

Piranesi, Giovanni Battista (1720-1778) Venetian architect, draughtsman and engraver. At the age of 20 he went to Rome. His topographical and archaeological etchings and further graphic illustrations of that city and its greatest vistas of Antiquity and Baroque belong to the masterpieces of line engraved or etched art within the veduta field. Another side of him is to be seen in his weird, dramatic confabulations of huge imaginary prisons and his fantasies over existing and non-existent buildings and landscapes of a richly varied and wild grandeur, that rightfully place him among the true masters within this field of graphic expression. His spirited handling of detail and of small human and animal figures, often done at a terrific speed, should be enjoyed through the magnifying glass because it reveals his virtuousity and spontaneity as a draughtsman. Artists like Bellotto (mentioned elsewhere) and P. have had enormous impact upon the way such themes have been treated in the following centuries, also in security graphics.

Pisanello, Antonio (perhaps 1395-1455/56) North Italian "gothic" medallist, painter and draughtsman. One of the purest and most unpretentious animal painters and portrait medallists of all times. A few very large frescoes by him have survived (in Verona), but apart from that most of his works are in minor, or even quite small formats. Among the things still left to us (in the Louvre, Paris) is one of the most important collections in existence of hand drawings, Codex Vallardi, that contains not only P.s own drawings (studies of animals, costumes, antiquities, sketches for paintings, and copies from drawings by other artists) but also a profusion of others that must be from pupils and collegues, all of it evidently kept by him as a "work collection". His medals are the most superb works of miniature bas-relief ever made in Italian art.

portrait engraving is nearly always free-hand engraving (see p. 12 and the insides of the cover) but it can, occasionally, be relief engraving (the "master plate" then being a coin or a small bas-relief). The first portraits upon Danish banknotes (500 Kr. 1875) were relief engraved representations of H. C. Ørsted and Bertel Thorvaldsen, traced on the relief engraving machine after models made by Ph. Chr. Batz.

Preisler, Johan Martin (1715-1794) Danish copperplate engraver. Together with Clemens he was the most important of his century. And abroad, notably in Paris, they both enjoyed considerable repute. Called back to Denmark Pr. was appointed Engraver to the Royal Court. His masterpiece is the stately two-leaf engraving of Saly's equestrian statue of Frederik 5. in Copenhagen.

rag paper, paper of the finest sort, made predominantly from milled textile fibres (of linen or cotton rags). So if the term should happen to have a derogatory ring to the uninitiated reader this would be highly misleading. On the contrary: r. p. is the very best quality of paper there is.

relief engraving, mechanically guided linear engraving that transforms a 3-dimensional master plate (relief, coin, etcetera) into a 2-dimensional design, that is an authentic linear description of it, engraved upon the flat surface of a printing plate (Further explanation p. 20).

ruling, mechanically governed, systematized guidance of line engraving. Straight or curved. At regular or gradually varied intervals. Thus there are many forms and applications of r. Waveline patterns are very much used, and so are bolder lines intersecting finer ones (e. g. portrait backgrounds, details of lettering etcetera).

Saxton (?-?). One of the initiators of relief engraving. Not much is known of him, but together with Gobrecht he seems to have been of greater importance for the invention and development of the relief engraving machine than the more illustrious Spencer (whose main achievement and essential merit was the geometrical lathe).

screen. The modern, industrialized forms of pictorial reproduction from photographic, drawn or painted half tone originals are photographed through a quadratic grid of opaque lines upon a glass plate inserted behind the camera objective but in front of the film plane. This glass plate and its system of lines is called a s. Its function is to divide the original picture tones into a system of larger or smaller dots, according to the amount of darkness or light penetrating through each of the single squares formed by the grid. Thus the picture is transformed into a system of printable dots that form the impression of the original tone. Preferably these dots should not have a disturbing effect to the naked eye, but they are easily seen by closer scrutiny of any screened picture print when seen through a magnifying glass. Most of the pictures in this book (e. g. the photographs of Juel's paintings) are screened.

"scroll work" (see acanthus engraving.)

„shoulder" is a vernacular term in daily usage among professionals. It refers to the microscopically narrow zone along the edges of every single line where the flat surface of the plate *meets* the actual cut of the engraving. Thus a line has two „shoulders", and their quality (i.e. the sharpness and definition with which the sloping sides of the V-cut meet the horizontal surface plane) must be perfectly flawless in order to ensure the highest possible quality of wiping and printing.

siderography, (from Greek „sidero"-iron) the same as transferring. See p. 14 and 15.

„specimen" notes, officially distributed production samples of circulating banknotes, annulled by way of some clear cancellation mark that makes them void of money value.

Spencer, Asa (+ - 1847) American technician, born in Connecticut. He constructed the Geometrical Lathe or guilloching machine, and his work is extensively dealt with in the main text, see p. 15. He went to London as a member of the group of Americans that were invited to the hearings of the Society of Arts Etc. in 1818.

„stufigkeit", term used in some European countries for *gradation*. (See this).

taille douce, the classical form of free hand engraving by means of a steel burin on copper. Literally the word means „soft cut". (The text on the inside of the back cover tells somewhat more about this).

Tiepolo, Giovanni Battista (1696 - 1770) Venetian painter *after* the post-renaissance. In fact he was *the* top exponent of Italian baroque and rococo, and very likely he was the most gifted and overwhelming master of painting in the entire 18th century. His spate of enormous allegories with figures and veils, draperies and skies with astounding cloud compositions are done at a terrific speed, often (apparently at the drop of a hat) solving the problems of incredibly tricky and complicated angles of perspective with a deft authority and an impressive virtuousity that after his death could be traced for nearly a couple of centuries in the way the finest designers and engravers treated similar themes in engraving.
In security engraving such idealized divinities were found useful already at an early stage. Asher Durand in New York introduced „mythological" scenes (although in the admittedly superbly engraved, but somewhat tame and restricted „Greek" vein of his age!) already in the 1820s. This trend of using allegorical figures with flowing robes and billowing draperies floating in airy perspectives of cloud formations came into widespread use upon banknotes and security documents, not only because of their convenient versatility of interpretation but also on account of the wide range of tonal scope that such motives offered the designers and the engravers. This odd and lofty realm of peculiar „goddesses" and symbolic superhumans was singularly well fit for imaginative ornamental picture engraving with vivid and wide ranges of „manners" and tonalities, so they spread like an epidemic and appeared upon hundreds of bonds, shares and banknotes throughout the 19th century, and they are still not at all rare even in the latter third of the 20th! In this field artists like Tiepolo (but also Rubens, Correggio and many others) have, without knowing it, started a tradition.

tonal step etching. Any machine-ruled, guilloched or free-hand made line work in an etching ground can be gradated in several tonal shades by varying the duration of acid application in such a way that the lightest parts are etched very lightly (i.e. for a very short time) and then covered with some protective layer (of varnish or bitumen) when the desired depth has been obtained. And the parts that are wanted darker still are then exposed to further acid biting, so in the end this stepwise etching will cause the lines to vary in width and depth from one part of the area to the next, according to the duration of bite. The final result will show precise tonal gradations of an otherwise uninterrupted line pattern because the deeper and wider etch will cause a darker total effect of an identical linear design.

transferring (or siderography), embossed metal reproduction of engravings. See text p. 14 and 15.

veduta. The word is Italian and simply means „view". In art history, however, it is commonly used as a somewhat more specific label, usually referring to panoramic landscape paintings or drawings and engravings, especially of the Italian 1700 and 1800s. But this kind of topographic narration in landscape art has of course spread to almost every civilized country, and in a way nearly all representative landscape art since then could be called v. The degree of fidelity can vary a great deal. Sometimes the works are of incredible precision right down to the tiniest architectural details, and at other times they are pure fantasies. Others again are of imaginary places, but showing existing or planned buildings, often in non-existing juxtapositions. They may be precise and dry matter-of-fact descriptions, or they may be poetic mood interpretations of the weather or of suggestive light effects, etc., e.g. among antique ruins or in streets with palaces, churches and bridges for instance in Venice or Rome.
Among the most famous of veduta-artists are the 18th century Venetians Panini, Guardi, Canaletto and the already mentioned Bellotto and Piranesi. The traditions set by these artists have been of paramount importance to all later treatment of similar motifs in all illustrative engraving, also in security graphics.

wash, a technique of making tones in an original drawing by means of a watercolour brush, often with a watered dilution of the medium with which the pen lines of the picture have been drawn. In French called „encre lavé" („washed ink"). Such encre lavés have often served as originals for engraving.

white-line work. In this booklet the words „wh.-l.w." have been used only of guilloches where the line pattern stands white (in the unprinted paper) whilst the ground spaces between the lines are printed in more or less heavy layers of ink. Often these ink layers are so heavy that they can easily be felt by the fingers.
So in the present context this usage has been maintained throughout, solely in order to segregate clearly the two different kinds of geometric line work. (Apart from this the term wh.-l-w- is, of course with equal right, used of any form of engraving where the cut lines are meant to be reproduced in white (unprinted) paper upon dark (printed) ground).

xylography. The strict sense of the word is „wood-cutting, meant for printing" and it would be entirely justified to use it about any such woodcut, be it a bold and primitive mediaeval one, printed from some inked plank, carved with a knife or be it for instance a highly sophisticated Japanese colour print of infinite finesse both in carving and inking. But in professional terminology there is a distinct difference between *woodcuts* and *wood engravings*. The word x. would nearly always refer to the latter of the two.
A common *woodcut* is carved, mostly by means of knives, in the planed surface of the lengthwise plank of the wood, whereas a *wood engraving* is done with the burin in the grain of a planed surface, cut across the growth direction of some very dense and hard wood (mostly boxwood, but also pearwood and other hard sorts are used). In England the name above all in this technique is of course Thomas Bewick who practically re-invented or revived it. But throughout the 19th century and practically right up to World War I this developed into a venerable craft, that even evolved specific tools of its own (e.g. many-pointed burins for parallel line structures, etc.) and x. became a highly esteemed way of creating illustrations for nearly all kinds of letterpress printing before the much cheaper etched and screen-photographed metal printing blocks became of sufficient quality to displace them. Thus the novels, schoolbooks, cataloques and newspapers of our grandparents had illustrations, often very large ones, done by xylographers who occasionally commanded very impressive degrees of professional skill. Some of these illustrations were very clever indeed and many a picture for articles and short stories may have lasted weeks or months to engrave!
The craft as such is now practically extinct. But in the field of security graphics it is still alive here and there. Especially French, Belgian and certain overseas (former French dominated) territories still have banknotes where large parts of the work is made in polychrome x., combined in register with taille-douce engraving.
(The word is derived from Greek „xylon"-wood, and „graphein" - to write or draw).

Literature

Ian Angus: *Paper Money,* Ward Lock, London 1974,
(this is a deft piece of journalism and the text has minor occasional errors, but as a general survey it is good and sound. An easily read and entertaining account with a popular aim.)

Banco Central do Brasil: *Iconografia do meio circulante do Brasil,* Brasilia 1972,
(a large, authoritative and richly illustrated work of reference giving a complete survey of the banknotes (and coins) of Brazil throughout their entire history of issue. Specially interesting because during its existence the Banco Central do Brasil has had its banknotes printed by many different security printing works before they acquired their own. So this collection is very diversified and instructive. The text might present minor problems: it is in Portuguese, but data, names of firms etc. are easily found out.)

Banco de España: *Los billetes del Banco de España 1782 – 1974,* Madrid 1974.
(In Spanish. A thorough and well-produced volume, showing numerous fine examples of banknotes of Spanish issue in very nice multicolour fine-screen reproduction, printed upon white, glossy paper, so there would of course be no point in inspecting them through the magnifying glass, but æsthetically they form an interesting selection of articulate security graphic achievements.)

Deutsche Bundesbank: (several authors) *Frühzeit des Papiergeldes,* Giesecke & Devrient, Munich 1970,
(in German, with an admirable literature list.)

Friedberg: *Paper Money of the United States,* New York 1953,
(a catalogue, mainly intended as a price list for collectors, but it contains black/white letterpress reproductions of US-dollar notes through the ages.)

W. H. Griffiths: *The Story of American Bank Note Company,* New York 1959.

Henri Guitard: *Vos Billets de Banque,* Editions France-Empire, Paris, 1963,
(a popular, yet comprehensive account of the French school of banknote traditions that in several respects differ significantly from those of other schools. Most competently written by a true professional expert.)

L. Heath: *Government Counterfeit Detector,* Boston 1866 and later (rare).

Gene Hessler: *U. S. Paper Money,* Regnery Company, Chicago 1974,
(an authoritative, scholarly and complete catalogue.)

J. Hyberg: *De enskilda bankernas sedlar,* Gothenburg 1902 (in Swedish).

Lagerquist & Böös: *Sedlar,* Nordstedts, Stockholm 1971,
(in Swedish, with a short technical summary by Åke Eldh).

A. D. Mackenzie: *The Bank of England Note,* Cambridge University Press, 1953.

King O. Mao: *History of Chinese Paper Money,* Hong Kong 1968.

Ernst Nathorst-Böös: *Hela världens tjuv,* Nordstedt & Söner, Stockholm 1973,
(in Swedish. A scholarly account of legislative measures and penal practice as used in various countries during darker ages of crime persecution and punishment. Perhaps a trifle on the meticulous side, but decidedly worth while for those who can cope with the language.)

Roland Nitsche: *Money,* Collins, London 1970 and McGraw-Hill, New York 1970,
(a handy and skilfully produced popular volume, most competently done by an experienced and highly qualified writer.)

Albert Pick: *Das Buch vom Geld,* I-II, Urbes, Hamburg 1959,
(in German. A popular survey.)

Albert Pick: *Papiergeld,* Klinkhard & Biermann, Braunschweig 1967,
(in German. A thorough, and nicely illustrated, volume.)

U. S. Secret Service: *Know Your Money,* Government Printing Office, Washington D. C. 1968,
(a small public-relation pamphlet from official sources. There are several editions.)

Laurence Dwight Smith: *Counterfeiting, Crime against the People,* Norton & Co., New York 1944,
(a comprehensive and very popular account, written in a lively, at times directly novelistic form, that might perhaps arouse scepticism with the public. This should, however, not deceive the genuinely interested readers. Undoubtedly this is the best commonly available piece of literature for the layman.)

Society of Arts Etc.: *Report and Approved Communications and Evidence Relative to the Mode of Preventing the Forgery of Bank Notes,* London 1819, (very rare).

And generally about taille-douce you might choose:

–in French for instance:

Henri Delaborde: *La Gravure, Précis élémentaire de ses origines, de ses procédés et de son historie,* Quantin, Paris (without year of printing).

–or in English:

John Buckland-Wright: *Etching and Engraving,* The Studio Ltd., London 1953.

Arthur M. Hind: *A History of Engraving & Etching,* Dover Publications (no. T 954), New York 1963,
(a thoroughly well-produced paperback on the subject.)

F. L. Wilder: *How to Identify Old Prints,* Bell & Sons, London 1969.

The more entertaining or sensational aspects of this field (large cases of counterfeiting, remarkable criminal processes and strategically backed State attempts, etc.) are elegantly, but reliably dealt with in:

Murray T. Bloom: *Money of Their Own,* Ballantyne Books, New York 1960,
(which is an abridged paperback popularization of the same author's more extensive volume: *The Great Counterfeiters,* Scribner Sons, New York 1957.)